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ARNOLD ARBORETUM
HARVARD UNIVERSITY

ARNOLDIA



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THE ARNOLD ARBORETUM SPRAY SCHEDULE

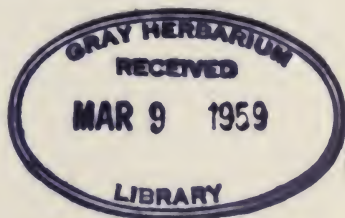
IN THE continuing war against the insect and disease enemies of over 6,000 kinds of woody plants growing in the Arnold Arboretum, the battle lines have flexed and the battle methods and ammunition in the form of spray formulas are continually being modified. These changes have resulted not only from increased knowledge and experience with the spray materials, the introduction of new spray materials, and the timing of spray applications, but also with the desire to control other insects.

Sanitation by removal of dead plants and parts of plants which may serve as a breeding area for insect and disease organisms, is an important adjunct in the control of the pests of plants. The ability of plants in good health and vigor to resist insect and disease attacks in many cases is well known; consequently, we try to keep our plants growing vigorously, thus helping in the battle against insects and diseases.

Information for this spray schedule has been collected from many sources, especially the Cornell University Departments of Entomology and Plant Pathology and the Shade Tree Laboratories of the Waltham Field Station of the University of Massachusetts. We have used most of the sprays in our pest-control program; a few we consider experimental until more results can be noted. Not all sprays are applied each year and those used are not applied to all listed host plants each time; rather, we try to spray to control a specific pest as the need occurs.

This listing is not presented as necessarily the best sprays for control of these pests, but it is a record of what we use to meet our insect and disease problems. The notes given are important. Special attention is called to those cases where a repetition of the spray is required. To succeed in the continuing battle against insect and disease attacks on plants, three things are essential: (1) Apply the right spray. (2) Apply it properly. (3) Apply it at the proper time. Failure to meet any one of these prerequisites materially reduces the effectiveness of the spray.

[1]



ARNOLD ARBORETUM SPRAY SCHEDULE — 1959

Date	Insect or Disease	Host Plants	Hydraulic Spray per 100 Gals. Water		Notes
March 1 to April 20 (Dormant)	Armored Scales: Euonymus Oyster Shell Scurfy San Jose	Celastrus, Crataegus, Dirca, Euonymus, Fraxinus, Popu- lus, Syringa, Chaenomeles, Malus, Prunus, Pyrus, Sorbus	1 gal. D-N slurry (Elgetol or Krenite)		Spray on good drying days when the spray will dry before the temperature goes be- low 40° F. Spray before the buds start to open. This material will discolor paint, stone, etc.
	Cedar-apple Rust	Crataegus, Juniperus, Malus, esp. M. soulardii			"
	Golden oak Scale	Quercus	2-3 gals. dormant superior- type spray oil plus $\frac{1}{2}$ lb. blood albumen		Spray on good drying days when the spray will dry before the temperature goes below 40° F. Spray before the buds have opened.
	Juniper scale Pine Needle Scale	Juniperus Pinus	11 gals. liquid lime sulphur		This material will discolor paint, stone, brick, etc.
	Spruce gall aphid	Picea, esp. P. abies, P. pungens vars.	1½ pts. 50 or 57% malathion emulsifiable concentrate		Warm weather before buds have broken.
April 15 to 30 (Dormant)	Elm bark beetle (Dutch Elm Disease)	Ulmus	8 gals. 25% DDT emulsifi- able concentrate or 6 gals, 34% DDT emulsifi- able concentrate		Mist blower application: 1 part 25% DDT emulsifiable concen- trate plus 1 part water; or 1 part 34% DDT emulsifiable concen- trate plus 1½ parts water. Watch for mite and aphid troubles after any of these sprays.
	White Pine Weevil	Pinus strobus	4 gals. 25% DDT emulsifi- able concentrate		Cover upper part of tree, especially top of main leader and ends of branches, thoroughly.
	European Pine Shoot Moth	Pinus, esp. P. resinosa, P. mugo	4 lbs. 50% DDT wettable powder		

May 1 to 10	Lilac Borer	Fraxinus, Syringa	1 gal. 25% DDT emulsifiable concentrate	Spray especially stems and larger branches. Repeat in two weeks.
	Fire-blight	Cotoneaster, Crataegus, esp. C. oxyacantha vars.; Malus, Pyrus, Sorbus	Streptomycin 15% plus Oxytetracycline 1.5% (Agri-mycin 100, $\frac{1}{2}$ of 9.34 oz. bottle)	Do not combine with other sprays. First spray at 20 to 30% bloom. Repeat every 3 to 5 days during blossom time, best when temperature above 70°. Re-apply if heavy rains occur within 18 hours of application. Helps reduce blossom infections, not infections from old cankers.
	Bacterial Blight of Lilac	Syringa	1 pt. Puratized Agricultural Spray	Repeat once a week, especially during wet seasons, during the month of May.
		Platanus	"	One application as buds begin to swell.
	Anthracnose of Sycamore and Oak	Quercus, esp. Q. alba		
		Prunus, Malus	2 lbs. 50% DDT wettable powder	If not too abundant, prune out and burn nests instead of spraying.
	Tent Caterpillar	Juniperus, esp. J. squamata vars.	2 lbs. 50% DDT wettable powder plus 2 lbs. 50% Ovex (Ovatran) wettable powder	Thorough drenching necessary, as soon as weather warms up and worms start feeding.
May 10 to 15	Hawthorn Leaf Miner	Crataegus	1 lb. 25% lindane wettable powder; or 4 lbs. 25% malathion wettable powder	A few days to a week earlier than birch leaf miner spray. If injury has been severe in the past, repeat in 10 days.
May 15 to 25	Birch Leaf Miner	Betula	1 lb. 25% lindane wettable powder; or 4 lbs. 25% malathion wettable powder	When adult flies are abundant and minute miners can be found; on a warm day. As lilacs start to bloom. Repeat in 10 days; then again July 10-15 for second generation, if needed.
	Elm Leaf Miner	Ulmus	"	Usually a few days later than birch leaf miner.

<i>Date</i>	<i>Insect or Disease</i>	<i>Host Plants</i>	<i>Hydraulic Spray per 100 Gals. Water</i>	<i>Notes</i>
May 15 to 25	Lacebug	Azalea, Pieris, Rhododendron	4 lbs. 25% malathion wet- table powder; or 1 lb. 25% lindane wettable powder	Malathion preferred as it also controls mites and aphids. Spray undersides of leaves. Repeat 10 days later.
	Pine Bark Aphid	Pinus, esp. <i>P. strobus</i> , <i>P. nigra</i> , <i>P. sylvestris</i>	1 ½ pts. 57% malathion emulsifiable concentrate	Repeat in two-week intervals for heavy infestations.
	Beech Woolly Aphid	Fagus	"	Apply to underside of branches and trunk.
	Juniper Scale	Juniperus, esp. <i>J. chinensis</i> <i>pfitzeriana</i> . Occasionally on Thuja	6 lbs. 25% malathion wet- table powder	Warm weather in mid-May before scales begin to lay eggs. Repeat twice at two-week intervals.
	Cankerworm	Acer, Carya, Catalpa, Fraxinus, Juglans, Prunus, Quercus, Syringa, Tilia, Ulmus	2 lbs. 50% DDT wettable powder plus 2 lbs. 15% aramite wettable powder	Mist blower application: 7 gals. 25% DDT emulsifiable concen- trate plus 14 gals. water, plus 1 qt. 25% aramite emulsifiable concentrate. As lilacs come into full bloom.
	Elm Leaf Beetle	Ulmus	"	"
	Willow-Leaf Beetle	Salix	"	"
	Larch Case-bearer	Larix	"	When young larvae found feeding, usually mid-May.
	Mealybug	Buxus, Ligustrum, Taxus	1 ½ pts. 57% malathion emulsifiable concentrate	Thorough and heavy. Repeat in 10 to 14 days.
	Kalmia Leaf Spot	Kalmia	10 lbs. wettable sulphur	A sulphur dust may be applied instead. Repeat at 10- to 14-day intervals, especially if season is rainy, until foliage is full-grown.
	Boxwood Leaf Miner, Boxwood Psylla	Buxus	2 lbs. 50% DDT wettable powder plus 2 lbs. 15% aramite wettable powder	When weigela is in full bloom.

Spruce Mite "Red Spiders"	Conifers, esp. Picea, Thuja, Chamaecyparis	2 lbs. 50% Oxex wettable powder	Repeat in late August or September, if needed. (Do not apply Oxex to Ilex, Phil- adelphus, Cornus, Stewartia, Laburnum, or other Rosaceae plants in May or June.)
Mite or "Red Spiders"	Ornamentals and fruits, as: Azalea, Quercus, Ulmus, Gleditsia, Tilia, Buxus, Malus, Prunus, Pyrus, etc.	4 lbs. 25% malathion wet- table powder; or 2 lbs. 15% aramite wettable powder	Malathion preferred as it controls other pests also. Repeat later as needed on various plants. If aramite used, repeat in 10 days.
Powdery mildew	Rosea, esp. R. wichuraiana	$\frac{1}{2}$ lb. Ferbam plus 3 lbs. wetable sulphur	Avoid use of sulphur at temperatures over 90° F. Repeat once a week and especially apply before rainy periods.
May 25 to June 30	Locust Twig Borer	2 lbs. 50% DDT wettable powder plus 2 lbs. 25% malathion wettable powder	Start in late May and repeat weekly through June.
June 1 to 10	Euonymus Scale Crawler	4 lbs. 25% malathion wet- table powder, plus 2 lbs. 50% DDT wettable powder.	Repeat August 15 to 25 for second generation.
June 10 to 15	Flat-headed Apple Tree Borer	1 gal. 25% DDT emulsifiable concentrate	On stems and larger branches, especially near the ground. Repeat in two weeks.
	Holly Leaf Miner	2 lbs. 50% DDT wettable powder plus 2 lbs. 15% aramite wettable powder	Repeat in 10 days.
	Lacebug	4 lbs. 25% malathion wet- table powder	Will also help control mites. Repeat in 10 days.
June 10 to August 15	Dogwood Twig Borer	1 gal. 25% DDT emulsifiable concentrate	Spray trunks and branches, especially where bark is rough. Repeat at 3- to 4- week intervals for the 2-month period.
June 20 to 30	Black Vine Weevil	2 lbs. 25% dieldron wet- table powder; or 5 lbs. 40% chlordane	Treat whole plant, especially heavy on branches close to ground, plus surface of soil.

<i>Date</i>	<i>Insect or Disease</i>	<i>Host Plants</i>	<i>Hydraulic Spray per 100 Gals. Water</i>	<i>Notes</i>
June 25 to July 5	European Pine Shoot Moth	Pinus, esp. <i>P. mugo</i> , <i>P. nigra</i> , <i>P. resinosa</i> , <i>P. sylvestris</i>	2 lbs. 50% DDT wetttable powder	Thoroughly wet bases of new needles— when larvae are boring into buds.
	Elm Bark Beetle (Dutch Elm Disease)	Ulmus	4 lbs. 50% DDT wetttable powder plus 2 lbs. 15% aramite wetttable powder	Thorough application. Mist application: 5 gals. 25% DDT emulsifiable concen- trate, 15 gals. water plus 1 qt. 25% aramite emulsifiable concentrate.
July 10 to 15	Azalea Bark Scale	Rhododendron, Azalea	4 lbs. 50% DDT wetttable powder plus 3 lbs. 25% malathion wetttable powder	Thorough wetting of stems. Repeat in 10 days.
	Peach Tree Borer	Prunus, esp. <i>P. persica</i>	1 gal. 25% DDT emulsifiable concentrate	Repeat in 2 weeks. Apply to stems and larger branches, especially near ground.
	Japanese Beetle	Ampelopsis, Aesculus, Hydrangea, Metasequoia, Rosa, Sassafra, Tilia, Vitis,	2 lbs. 50% DDT wetttable powder plus 4 lbs. 25% malathion wetttable powder	Spray on bright warm day to hit the beetle. Repeat every two weeks through mid-Aug.
July 15 to 25	Golden Oak Scale	Quercus	1 qt. 25% DDT emulsifiable concentrate plus 1½ pts. 50% malathion emulsifiable con- centrate	To kill young when they start to crawl.
Aug. 10 to Sept. 30	Locust Borer	Robinia	4 lbs. 50% DDT wetttable powder. After Sept. 15, add 3 lbs. 25% malathion wetttable powder	Repeat the spray at 10-day intervals. Thorough wetting, especially on rough bark.

PESTS FREQUENTLY DESTRUCTIVE IN THE ARNOLD ARBORETUM

Host	Pest	Spray Date
Acer	Cankerworm	May 15-25
Aesculus	Japanese beetle	July 10-15 (with repeat)
Amelanchier	Lacebug	June 1-10 (with repeat)
Ampelopsis	Japanese beetle	July 10-15 (with repeat)
Azalea (Rhododendron)	Lacebug	May 15-25 (with repeat)
	Mite or "Red Spider"	May 15-25
	Azalea bark scale	July 10-15 (with repeat)
Betula	Birch leaf miner	May 15-25 (with repeat)
Buxus	Boxwood leaf miner)
	Boxwood psylla) May 15-25
	Mite or "Red Spider")
	Mealybugs	May 15-25 (with repeat)
Carya	Cankerworm	May 15-25
Catalpa	Cankerworm	May 15-25
Celastrus	Euonymus scale	March 1-April 20; June 1-10
Chaenomeles	Oystershell scale) March 1-April 20
	San Jose scale)
Chamaecyparis	Spruce mite or "Red Spider"	May 15-25
Cornus	Dogwood twig borer	June 10-Aug. 15 (with repeat)
Cotoneaster	Fire-blight	May 1-10 (with repeat)
	Lacebug	June 1-10 " "
Crataegus	Oystershell scale)
	San Jose scale) March 1-April 20
	Cedar apple rust)
	Fire-blight	May 1-10 (with repeat)
	Leaf miner	May 10-15
Dirca	Euonymus scale	March 1-April 20; June 1-10
Euonymus	Euonymus scale	March 1-April 20; June 1-10
Fagus	Beech wooly aphid	May 15-25 (with repeat)
Fraxinus	Oystershell scale	March 1-April 20
	Lilac borer	May 1-10 (with repeat)
	Cankerworm	May 15-25
Gleditsia	Mite or "Red Spider"	May 15-25
Hydrangea	Japanese beetle	July 10-15 (with repeat)

Host	Pest	Spray Date
Ilex	Holly leaf miner	June 1-10 (with repeat)
Juglans	Cankerworm	May 15-25
Juniperus	Cedar apple rust	March 1-April 20
	Juniper scale	March 1-April 20; May 15-25 (with repeat)
	Juniper web-worm	May 1-10
Kalmia	Kalmia leaf spot	May 15-25 (with repeat)
Larix	Larch case-bearer	May 15-25
Ligustrum	Mealybugs	May 15-25 (with repeat)
Malus	Oystershell scale) March 1-April 20
	Cedar apple rust	
	Fire-blight	May 1-10 (with repeat)
	Tent caterpillar	May 1-10
	Mite or "Red Spider"	May 15-25
	Flat-headed apple tree borer	June 1-10 (with repeat)
Metasequoia	Japanese beetle	July 10-15 (with repeat)
Pachistima	Euonymus scale	June 1-10 (with repeat)
Pachysandra	Euonymus scale	June 1-10 (with repeat)
Picea	Spruce gall aphid	March 1-April 20
	Spruce mite or "Red Spider"	May 15-25
Pieris	Lacebug	May 15-25 (with repeat)
Pinus	Pine needle scale	March 1-April 20
	White pine weevil	April 15-30
	European pine shoot moth	April 15-30; June 25-July 5
	Pine bark aphid	May 15-25 (with repeat)
Platanus	Anthraxnose	May 1-10
Populus	Oystershell scale	March 1-April 20
Prunus	Oystershell scale	March 1-April 20
	Tent caterpillar	May 1-10
	Mite or "Red Spider") May 15-25
	Cankerworm	
	Peach tree borer	July 10-15 (with repeat)
Pyrus	Oystershell scale	March 1-April 20
	Fire-blight	May 1-10 (with repeat)
	Mite or "Red Spider"	May 15-25
Quercus	Golden oak scale	March 1-April 20; July 15-25
	Anthraxnose	May 1-10

Host	Pest	Spray Date
Quercus	Mite or "Red Spider") Cankerworm)	May 15-25
Robinia	Locust twig borer Locust borer	May 25-June 30 (with repeat) Aug. 10-Sept. 30 (with repeat)
Rosa	Powdery mildew Japanese beetle	May 15-25 (with repeat) July 10-15 (with repeat)
Rosa rugosa	Flat-headed apple tree borer	June 1-10 (with repeat)
Rhododendron	Lacebug Azalea bark scale	May 15-25 (with repeat) July 10-15 (with repeat)
Salix	Willow-leaf beetle	May 15-25
Sorbus	Oystershell scale Fire-blight Flat-headed apple tree borer	March 1-April 20 May 1-10 (with repeat) June 1-10 (with repeat)
Sassafras	Japanese beetle	July 10-15 (with repeat)
Syringa	Euonymus scale) Oystershell scale) Lilac borer) Bacterial blight) Cankerworm	March 1-April 20 May 1-10 (with repeat) May 15-25
Taxus	Mealybugs Black vine weevil	May 15-25 (with repeat) June 20-30
Thuja	Spruce mite or "Red Spider" Juniper scale	May 15-25 May 15-25 (with repeat)
Tilia	Cankerworm) Mite or "Red Spider") Japanese beetle	May 15-25 July 10-15 (with repeat)
Tsuga	Black vine weevil	June 20-30
Ulmus	Elm bark beetle Elm leaf miner) Elm leaf beetle) Mite or "Red Spider") Cankerworm)	April 15-30; June 25-July 5 May 15-25
Viburnum	Dogwood twig borer	June 10-Aug. 15 (with repeat)
Vitis	Japanese beetle	July 10-15 (with repeat)

Small Amounts of Spray Materials

Estimating small amounts of spray materials from the amounts suggested in this schedule can be done in the following way: Use one level tablespoonful of a wettable powder to a gallon of water where the formula calls for one pound of the wettable powder to a hundred gallons of water; or use one level teaspoonful of liquid material per gallon where the formula calls for a pint of the liquid to a hundred gallons of water; or a level tablespoonful of liquid material per gallon where the formula calls for three pints per 100 gallons.

ROBERT G. WILLIAMS

REMINDER

Arnoldia Subscriptions are now due and all notices were mailed in January. Those who have not yet sent in their 1959 subscriptions, please do so at once (price \$2.00), mailing it to "Arnoldia," Arnold Arboretum, Jamaica Plain 30, Mass. **Please make checks payable to Harvard University.**

Subscriptions for 1959 not paid by April 1 will be discontinued.



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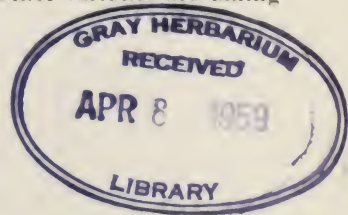
THESE ARE THE FORSYTHIAS

ALL forsythias have yellow flowers. All but three are vigorous growing shrubs that are planted chiefly for their bright early-spring flowers. Some twenty-nine species, varieties, and cultivars are being offered by American nurserymen. All but two of these are grown in the Arnold Arboretum, in addition to a few others. The busy plantsman need only be interested in seven or eight of them, although the "collector" or the individual who is striving for unusual effects may be interested in others. A study of this group over the years at the Arnold Arboretum, has indicated that the following are the best for general landscape use.

Forsythia suspensa sieboldii: This is the first forsythia to be introduced into European and American gardens; in Holland, in 1833; in England, about twenty years later; and in America, probably shortly thereafter. It is the form with the long, graceful, often procumbent branches that is sometimes seen planted at the edge of a wall where the long stems have an opportunity to hang down vertically for several feet. The stems root easily wherever they touch moist soil; the flowers are a brilliant yellow (Nickerson Color Fan 5Y 9/13 and about $1\frac{1}{8}$ inches in diameter.

F. suspensa fortunei: Professor Charles S. Sargent said that the Arnold Arboretum first introduced this to American gardens about 1878. This is the form with gracefully arching branches, more upright in habit than Siebold's forsythia, and because it has been so popular so long, it is the form of *F. suspensa* which everyone has come to associate with this genus. The flowers are the same color as those of Siebold's, only slightly larger.

There are other varieties of this species being grown in the Arnold Arboretum and being offered for sale by American nurserymen. All have the gracefully-arching, sometimes often procumbent, branching of these two. *F. suspensa* varieties do not produce as many nor as large flowers as do the *F. intermedia* varieties. During the fifty and more years they have been grown, other varieties are taking



the place of these in many plantings, but the two mentioned could well be retained, especially for their habit. Many a gardener prefers these two for the very fact that they are more graceful and do not have such a mass of clustered flowers as the others.

F. *intermedia spectabilis*: Commonly called the showy-border forsythia, this originated in the great Spaeth Nurseries of Berlin, in 1906; it was introduced into America by the Arnold Arboretum in 1908. It is still one of the most popular of all, with flowers that are as vivid a yellow as the 'Beatrix Farrand' only recently introduced. Being an *F. intermedia* variety, it is more upright and sturdy than *F. suspensa*, the flowers are larger (about $1\frac{3}{4}$ inches) and are produced in greater quantity and in clusters. Some consider the color display is almost a "brassy" yellow, yet there are many who prefer it for just this reason. It is a darker yellow than the *F. suspensa* varieties (vivid yellow, 2.5Y 8.5/13 of the Nickerson Color Fan) and with 'Beatrix Farrand,' can be classed as having the darkest yellow flowers of the entire group.

'Beatrix Farrand': This is a cross between a colchicine-induced tetraploid and *F. ovata*, being a triploid, originating in the Arnold Arboretum in 1939 as a result of the plant-breeding work of Dr. Karl Sax. The flowers are often as much as $2\frac{1}{2}$ inches in diameter and, in certain situations, are slightly darker than those of *F. intermedia spectabilis*. It is upright and dense in habit, produces heavy bloom, and is becoming popular for its vivid yellow, conspicuous flowers.

'Lynwood Gold': This was originally found as a branch sport of *F. intermedia spectabilis* in a garden in Cookstown, County Tyrone, Ireland, and was introduced by the Donard Nursery of Newcastle, County Down, Ireland. It was introduced into America in 1953 by the Gulf Stream Nursery of Wachapreague, Virginia, and is considered an improvement over *F. intermedia spectabilis* in that its flowers are more open and seem to be better distributed along the stem, that is, not so bunched. It, too, is a brilliant yellow, only minutely lighter in shade than *F. intermedia spectabilis*, is upright in habit, possibly a little stiff, but still most beautiful in flower.

'Spring Glory': A branch sport of another of the Arnold Arboretum's introductions (*F. intermedia primulina*), this was found in the garden of Mr. H. H. Horvath, Mentor, Ohio, about 1930, and was introduced by the Wayside Gardens of Mentor, Ohio, about 1942. This and its parent, the primrose forsythia, have flowers that are a lighter yellow than the others, without being the objectionable greenish yellow of 'Arnold Dwarf.' It is an improvement over the once popular primrose forsythia, in that it has larger flowers (about two inches in diameter) and more of them, hence making a much better display. Because of this, it may well replace the primrose forsythia in general landscape use.

'Arnold Dwarf': Resulting as a cross between *F. intermedia* and *F. japonica* made by Dr. Karl Sax in the Arnold Arboretum in 1941, this should never be planted for its flowers which are small and greenish yellow, and are produced



PLATE I

Top: *Left* *F. japonica saxatilis*

Right *F. suspensa fortunei*

Center: *Left* *F. ovata*

Right *F. suspensa sieboldii*

Bottom: *Left* *F. intermedia spectabilis*

Right *F. europaea*

Note the heavy clusters of flowers in some species and few clustered or single flowers in others, the former making the more conspicuous display.

sparsely. In fact, plants may be five or six years old before they produce any flowers at all. As a woody ground cover it is excellent, chiefly because of the fact that its procumbent branches root readily wherever they touch moist soil. A six-year-old plant may be only two to three feet tall but nearly seven feet across, and as it grows older, it may grow a few feet taller. However, if desired, this taller growth can be removed easily with brush scythe or pruning shears. Its ability to remain comparatively low and to spread regardless of the slope on which it is planted, are its chief merits.

F. ovata: This should not be considered as one of the best forsythias in Hardiness Zone 5 or in warmer areas, since the flowers are small and often are produced erratically. However, in slightly colder areas, where the flower buds of the above-mentioned forsythias are known to be killed by winter cold, this might be tried, if a forsythia must be planted. Hence, its uses are limited greatly, but it is worth mentioning. In the collection at the Arnold Arboretum, it flowers about ten days before most of the other forsythias. E. H. Wilson first sent seeds to the Arnold Arboretum in 1917, collected from native plants in the Diamond Mountains in Korea. The original plant is still growing well.

Other forsythias growing in the collections of the Arnold Arboretum are: *F. europaea*; *giraldiana*; *intermedia* and its varieties *densiflora*, "dwarf," *primulina*, and *vitellina*; *japonica saxatilis*; *ovata* × *europaea*; *suspensa* and its varieties *atrocaulis*, *decipiens*, and *pallida*; *viridissima* and its varieties *bronxensis* and *koreana*; and 'Arnold Giant.'

An important policy ever since the Arnold Arboretum was established, has been to grow all the species, varieties, and cultivars possible of just such a group as the forsythias so that the better types are there for all to see, growing side by side with those that are less desirable. With such a collection, the Arnold Arboretum is in an excellent position to do breeding work, make scientific studies and to offer propagating material to others who want it for the same reasons.

Most of the forsythias should be in full bloom by mid-April, so that visitors to the Arnold Arboretum at that time might well make their own selections.

DONALD WYMAN

LECTURE SLIDES ON THE ARNOLD ARBORETUM

The Arnold Arboretum has a series of about 115 colored slides (35 millimeter) depicting "America's Greatest Garden," which may be rented for \$5.00, for giving lectures to interested groups. The slides are accompanied by a list giving a brief description of each. An accompanying booklet entitled "Through the Arnold Arboretum" furnishes the individual giving the lecture with much valuable information concerning the Arnold Arboretum.

Anyone interested in renting these slides should write to the Arnold Arboretum, Jamaica Plain 30, Mass., well in advance of the date when they are to be used, so that they can be reserved and mailed by the proper time.

ARNOLDIA



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CRAB APPLES OF MERIT

THE oriental crab apples are the best of the small ornamental flowering trees for landscape use, because they are outstanding in the spring when they are in bloom and again in the fall when they are in fruit. American nurserymen are growing 140 species and varieties to sell, and 250 different kinds are growing in the collections of the Arnold Arboretum. Each year we make specific notes about these trees, recording those that apparently bloom and fruit well every year, those that are definitely alternate in bearing, and those that are outstanding ornamentally for several specific reasons. The accompanying lists of some 60 species and varieties are those which can be considered among the best, if not the best, for ornamental purposes.

It is impossible to report all the good and bad points about these trees in a few pages. Suffice it to say here, since more detailed information concerning them is available in other publications, that these lists might be scanned carefully for specific purposes. Not everyone wants a pink flowering crab apple, and there are some who want any kind as long as the fruits remain on the trees well into the winter and are suitable for bird food.

Most of the crab apples native to the United States have green fruits, and although they may be beautiful for the few days they are in flower, they have little ornamental value in the fall. Also, the majority of these are susceptible to the disfiguring disease known as cedar apple rust, especially prevalent in areas where junipers and crab apples grow in the near vicinity. Because of this, only one or two of the native crab apples have been recommended.

Then there are those which may be beautiful in both flower and fruit, but which are notoriously alternate bearing. Only a few of these have been recommended, and these merely because their ornamental characteristics have been so outstanding that many want to grow them anyway.

Very few of the varieties with large fruits have been recommended. It has

been suggested that a crab apple has fruits up to two inches in diameter; those producing fruits larger than this are considered apples. However, even fruits one and one-half inches in diameter are almost too large, because these are susceptible to insect injury which mars and distorts the fruit, making it most unsightly. In order to prevent this, the trees must be sprayed, sometimes several times, in order to control the insects. It would seem advisable, then, to plant crab apples with much smaller fruits; those that will not have to be sprayed so often for this purpose, and which have fruits small enough so that they will either be eaten by the birds or will not clutter the ground when they fall. Because of this, very few of the larger-fruited crab apples are recommended here. There are always those plantsmen who wish a beautiful flowering tree and who also wish to make jellies from the large fruits. There are many good varieties for this purpose, and they are available from nurseries. The point to remember, however, is that in order to produce satisfactory and usable fruit, they must be sprayed properly.

The old-fashioned purple crab apple (*Malus purpurea*) has been planted widely in the past, but its flowers fade to a very poor washed-out purple color after being open only a few days. Many new varieties are now available which are much better than this species, having darker flowers and some of them do not fade too much. However, when grown in different locations or on different soils, or under different climatic conditions, the flower colors of some of these newer varieties do change. A conscious effort was made here to segregate those with red to reddish flowers, from the group with reddish-purple flowers, but this is not a hard and fast line of demarcation by any manner of means. There will be considerable purple in the flowers of the latter group and some in the other group as well, the amount more or less depending on growing conditions and weather.

Of those listed with double or semi-double flowers, the only one with outstanding fruit is 'Dorothea.' 'Henry F. du Pont,' and the *M. purpurea* varieties have purplish-red fruits, and the fruits of others are not very ornamental.

Many of the hybrids derived from *M. purpurea* have foliage that is markedly reddish green throughout the growing season. One of the best of these is 'Red Silver,' the under surface of its leaves being slightly grayish and the upper surface reddish. A few species and varieties will sometimes have a marked autumn color to their foliage, although this is not always true every year, in every situation.

The last grouping covers those with different forms or habits. Mostly, the oriental crab apples are small, rounded trees, but a few like *M. baccata*, are standard trees up to fifty feet or more in height. There are some that are definitely upright and even columnar in habit, although the columnar types will not retain this habit at maturity. As these trees grow older, heavier and heavier crops of fruits are borne on the branches so that they are bent downwards, eventually so far that they do not recover completely. Pendulous types, too, are listed; and low forms, of which *M. sargentii* is the lowest.

Among the following varieties will be found some excellent ornamental specimens. Of course, these are not the only ones available from commercial sources, but for those contemplating only a few trees, selections might well be confined to the following:

THE BEST OF THE CRAB APPLES

White Flowers

baccata and vars.	sargentii
'Beauty'	spectabilis albi-plena
robusta	'Tanner'
robusta percisifolia	

Pink Flowers

'Dorothea'	'Prince Georges'
coronaria nieuwlandiana	scheideckeri
'Evelyn'	spectabilis riversii
halliana parkmanii	'Van Eseltine'
ioensis plena	'William Sim'
ioensis 'Nova'	

Pink and White Flowers

arnoldiana	'Katherine'
baccata gracilis	robusta erecta
'Flame'	sargentii rosea
floribunda	

Red to Reddish Flowers

'Adams'	'Oekonomierat Echtermeyer'
'Almey'	purpurea aldenhamensis
atrosanguinea	purpurea lemoinei
'Baskatong'	'Radiant'
'Crimson Brilliant'	'Red Splendor'
'Henrietta Crosby'	'Sissipuk'
'Hopa'	'Strathmore'

Reddish-Purple Flowers

'Henry F. du Pont'	'Makamik'
'Jay Darling'	'Patricia'
'Liset'	purpurea eleyi

Double or Semi-Double Flowers

Number in parenthesis is the approximate number of petals.

<i>coronaria nieuwlandiana</i> (13-27)	'Katherine' (20)
'Crimson Brilliant' SD	'Prince Georges' (53-61)
'Dorothea' (16)	<i>purpurea aldenhamensis</i> SD
<i>halliana parkmanii</i> (15)	<i>purpurea lemoinei</i> SD
<i>hartwigii</i> SD	<i>scheideckeri</i> (10)
'Henry F. du Pont' SD	<i>spectabilis albi-plena</i> (15)
<i>ioensis plena</i> (about 33)	<i>spectabilis riversii</i> (9-20)
<i>ioensis</i> 'Nova' (18-35)	'Van Eseltine' (15)

Ornamental Fruits

R = red

Y = yellow

O = orange

'Almey'	R	<i>robusta</i>	R & Y
<i>baccata</i> and vars.	R & Y	<i>robusta percisifolia</i>	R
'Beauty'	R & Y	'Rosseau'	R
'Dolgo'	R	<i>sieboldii arborescens</i>	Y-R
'Dorothea'	Y	<i>toringoides</i>	R & Y
'Flame'	R	<i>toringoides macrocarpa</i>	R & Y
'Marshall Oyama'	Y & R	'William Sim'	R
'Radiant'	R	'Winter Gold'	Y
'Red Jade'	R	<i>zumi calocarpa</i>	R-O

Lasting Fruit

<i>baccata jackii</i>	<i>robusta percisifolia</i>
'Bob White'	<i>sargentii</i>
'Makamik'	'Tanner'
'Ormiston Roy'	'Winter Gold'
'Red Jade'	<i>zumi calocarpa</i>

Foliage Color

These crab apples usually have a marked reddish-green foliage color through much of the spring and summer.

'Baskatong'	'Patricia'
'Crimson Brilliant'	<i>purpurea</i> and vars.
'Evelyn'	'Red Silver'
'Hopa'	'Red Splendor'
'Liset'	'Rosseau'
'Makamik'	'Sissipuk'
'Oekonomierat Echtermeyer'	'Strathmore'



PLATE II

Malus 'Katherine' has pink-and-white double flowers.

Foliage of these crab apples may turn red to orange in the autumn.

baccata	'Prince Georges'
dawsoniana	'Rosseau'
'Evelyn'	'Strathmore'
ioensis plena	zumi calocarpa

Unique Forms

'Adams' - upright	'Oekonomierat Echtermeyer' - pendulous
baccata columnaris - columnar	'Red Jade' - pendulous
baccata gracilis - graceful foliage	robusta erecta - columnar
'Beauty' - upright	sargentii - low
brevipes - low	sargentii rosea - low
hartwigii - upright, globe-shaped	'Strathmore' - upright
hupehensis - fan-shaped	'Van Eseltine' - upright
'Marshall Oyama' - upright	

Further trials are needed for the following varieties:

- 'Blanche Ames'—An Arnold Arboretum seedling of *M. spectabilis riversii* with semi-double pink and white flowers, $1\frac{3}{8}$ inches diameter; yellow fruits $\frac{1}{4}$ inch diameter, but they fall very soon. Graceful growth habit. Originated in 1939, introduced in 1947.
- 'Burton's Yellow Fruited'—Apparently only offered by one nursery in 1957, we have no information concerning this variety.
- 'Butterball'—Plant received from the University of Washington Arboretum in 1957, and has not yet bloomed.
- 'Chestnut'—Introduced by the Fruit Breeding Farm of the University of Minnesota about 1949. The fruits are about 2 inches in diameter—too large for use as an ornamental.
- 'Ferrill's Crimson'—Offered by Ferrill's Nursery, Salem, Oregon; originated before 1953; somewhat similar to 'Red Silver.'
- 'Gladwyne'—A seedling recently selected by Mrs. Norman J. Henry of Gladwyne, Pa. Our small trees have not yet flowered.
- 'Gwendolyn'—Originated by A. F. den Boer, Des Moines, Iowa, 1936, introduced in 1944; a seedling of *Malus floribunda*; flowers single and pink, bright red fruits nearly one inch in diameter. Our small trees have not yet flowered.
- 'Golden Hornet'—First distributed by John Waterer & Sons, Bagshot, Surrey, England. It is said to be a natural cross between *M. sieboldii calocarpa* and *M. prunifolia coccinea*, originated prior to 1949.

'Goldfinch'—Probably an *M. baccata* seedling originated in Philadelphia about 1920, but not introduced until about 1953. We have no records of this except that the flowers are single and white, fruits small and yellow.

ioensis 'Plena Nana'—Discovered, probably as a sport, in nurseries of A. McGill & Son, Fairview, Oregon, prior to 1955. Leaves and flowers are identical with those of *M. ioensis plena*, but habit is more of a bush. Six-year plant is about 6 feet high and 4 feet across.

'Klehm'—Somewhat mixed up in the trade, the plants I have seen are forms of *M. coronaria*, said to have double flowers. Sometimes listed as *M. ioensis* 'Klehm.' Fruits are greenish. More growth information is needed.

'Lady Ilgen'—New variety with medium to large yellow fruits, introduced to America from Europe by the Montreal Botanic Garden, 1951.

'Mary Potter'—An Arnold Arboretum cross between *M. sargentii rosea* and *M. atrosanguinea* made in 1939, introduced in 1947; tends to breed true from open-pollinated seed.

'Mount Arbor Special'—Introduced about 1938 by the Mt. Arbor Nurseries of Shenandoah, Iowa; a cross between 'Hopa' and 'Red Silver' with reddish-purple foliage said to be a brighter color than that of other varieties.

'Northland'—Originated as a cross (McIntosh apple \times 'Dolgo') at the Fruit Breeding Farm of the University of Minnesota in 1926 (selected in 1938 as their No. 1423), named in 1957; hardy in northern Minnesota, fruits red, $1\frac{3}{4}$ inches long, resembling those of 'Dolgo' in shape, ripening in mid-August; good for jellies. The fruit is pretty large for a strictly ornamental crab apple, although excellent for a "general purpose" crab.

'Pillar of Fire'—Not new; this is the variety 'Strathmore,' renamed by Stern's Nurseries, Geneva, N.Y.

'Pink Beauty'—Originated before 1947 at the Government Experiment Station, Morden, Manitoba, Canada, as its No. 451. Seems to have few faults, but fruits drop by September 1. Flowers are single, pink; fruits are bright red, maturing in mid-August. Robert C. Simpson, Simpson Orchard Co., Vincennes, Indiana, named it before 1958.

'Pixie'—Originated by A. F. den Boer, Des Moines, Iowa, introduced 1948; single pink flowers, red fruits, semi-pendulous branching. The plant we have at the Arnold Arboretum is small and has not yet flowered.

'Prairie Rose'—Originated at the University of Illinois, Urbana, Illinois, as an open-pollinated seedling of *M. ioensis*; has double flowers and is thought to be more scab-resistant than Bechtel's crab apple.

- 'Pretty Marjorie'—A new variety from Holland received in the Arnold Arboretum in 1958; has not yet bloomed.
- 'Professor Sprenger'—Originated prior to 1950 as a clone of *M. zumi* selected by S. G. A. Doorenbos, The Hague, Holland; the fruit is said to be orange and remains on the tree until January. We do not yet have this in our collection.
- purpurea 'Eleyi Compacta'—Introduced by S. G. A. Doorenbos, The Hague, Holland, 1952; flowers similar to *M. purpurea eleyi* but slightly deeper and a very dense, compact habit. Fruits are purplish-red.
- 'Rainbow'—Offered by Big Rock Nursery, Big Rock, Illinois, actually not a new variety but five standard varieties budded on 'Hopa' understock.
- 'Seafoam'—A seedling selection of *M. 'Oekonomierat Echtermeyer'*, made in 1939, named in 1952 by A. F. den Boer, Des Moines, Iowa, with apparently a pendulous habit.
- 'Shakespeare'—A selection of *M. atrosanguinea*, made before 1957 by E. H. Scanlon of Olmsted Falls, Ohio; said not to fade in flower as badly as the species.
- 'Sunburst'—Not new; this is 'Hopa' renamed by Stern's Nurseries, Geneva, N. Y.
- 'Upton Pyne'—Recently introduced from England, this is actually an apple, with large fruit streaked pink.
- 'Valley City'—Several seedlings originating at Northwest Nursery Co., Valley City, N. D.; selected as substitutes for the purple-leaved plum. Some question as to sufficiently outstanding merit for propagation in the East.
- 'Van Houttei'—Offered by R. C. Notcutt, Ltd., Woodbridge, Suffolk, England, with white flowers and yellow fruits. Introduced into America in 1958.

DONALD WYMAN

Still time to register for the following Spring Classes:

- Field Class:** Jamaica Plain — Dr. Donald Wyman
 April 24–May 29, Friday mornings 10–12 noon \$2.00
- Natural History of Non-Flowering Plants:** Case Estates, Weston —
 Mr. G. S. Torrey
 April 29–May 27, Wednesday afternoons 2–4 p.m. \$10.00
- Field Botany:** Case Estates, Weston — Dr. R. A. Howard
 May 5–June 2, Tuesday afternoons 2–4 p.m. \$2.00

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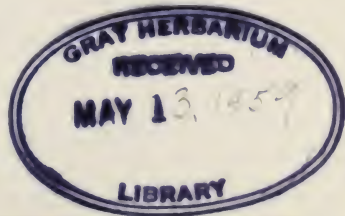
THE LILACS OF NEW ENGLAND

THE public interest in lilacs is most strikingly shown by the great number of people which come to view the Arboretum's collection of these plants each spring. It has been estimated that on a clear day at the peak of flowering in the latter half of May, crowds in excess of fifty thousand view this colorful spectacle. The numerous requests for identification of specimens and for information regarding the availability of cultivars in New England are other manifestations of this interest. It is in hope of aiding this latter group that this paper is being prepared.

My study of nursery catalogues and lists of offerings supplied by nurserymen has shown that 88 kinds of lilacs are offered for sale in New England. In the preparation of the lists and keys, the identification of the nurserymen offering these plants for sale is assumed to be correct. Names of cultivars which could not be verified from the checking of such authoritative works as Mrs. McKelvey's "The Lilacs" and "Lilacs for America," or for which the nurserymen offering it for sale could not offer satisfactory clarification of place and time of origin, are not included. The scientific names used in this article are taken from Rehder's "Bibliography of Cultivated Trees and Shrubs." Synonyms used by catalogues are cited in the text describing the plants.

Those who wish to know to what species the specimens growing in their collection belong, may find the key to be of use. No key could be made that would separate all of the cultivars found in *Syringa vulgaris*, so they are classified according to color and the presence of single or double flowers. The system of color classification is the same as that used in "Lilacs for America." In cases where there is a difference in the color given by the nurseryman and "Lilacs for America," the latter is followed. One should be aware that flower color may vary with the type of soil in which the plant is grown and with the age of the plant.

Lilacs which were judged as members of the one hundred best by a poll in "Lilacs for America" are indicated by an asterisk. Not all members of this group



were selected by a unanimous vote. Personal likes and dislikes need to be taken into consideration in the selection of plants for one's own situation. Examination of flowering specimens before purchasing is to be recommended whenever possible.

Each lilac name found in this list is followed by a code number or series of numbers indicating New England nurseries offering this plant for sale. In order to identify the nursery offering the plant for sale, consult the list of nurseries at the end of the article.

Key

- A. Corolla-tube not or little longer than calyx; anthers exerted on slender filaments; flowers white 1. *S. amurensis* var. *japonica*
- AA. Corolla-tube much longer than calyx; anthers subsessile.
 - B. Panicles from terminal buds, leafy at base (sometimes lateral in No. 7).
 - C. Leaves papillose, glaucous and glabrous beneath 2. *S. yunnanensis*
 - CC. Leaves not papillose, green to glaucescent and usually pilose at least along the midrib.
 - D. Corolla-tube funnelform gradually widened above the middle, lobes more or less upright; anthers below the mouth.
 - E. Panicles upright; anthers not reaching the mouth. . . . 3. *S. josikaea*
 - EE. Panicles pendulous or nodding, dense; anthers reaching the mouth.
 - 4. *S. reflexa*
 - DD. Corolla-tube cylindric or nearly so, lobes spreading.
 - E. Anthers reaching the mouth; infl. with 2 pairs of leaves, leaves cuneate at base.
 - F. Leaves pilose along the veins beneath or nearly glabrous, glaucescent, inflorescence compact. 5. *S. villosa*
 - FF. Leaves soft pubescent beneath, infl. loose. 6. *S. tomentella*
 - EE. Anthers below the mouth; inflorescence with 1 pair of small leaves or none, often with lateral panicles below; leaves rounded or broad cuneate at base. 7. *S. sweginzowii*
 - BB. Panicles from lateral buds; terminal bud usually wanting.
 - C. Leaves pubescent at least on midrib beneath; anthers usually violet or bluish gray; corolla about 6 mm. across.
 - D. Anthers inserted slightly below the mouth, equaling 1/2 to 1/3 of the tube; brts. usually short-pubescent. 8. *S. velutina*
 - DD. Anthers inserted above the middle of the tube, much below the mouth equaling 1/4 or 1/5 of the tube. 9. *S. microphylla*
 - CC. Leaves glabrous, or if pubescent, broad-ovate and truncate or subcordate at base.
 - DD. Leaves entire or 3-9 lobed in No. 14; corolla about 1 cm. across; flowering branches without terminal bud.
 - E. Leaves broad-ovate or ovate, subcordate to abruptly broad-cuneate at base; infl. large.
 - F. Flowers purple. 10. *S. vulgaris* var. *vulgaris*
 - FF. Flowers white. 11. *S. vulgaris* var. *alba*
 - EE. Leaves oblong-ovate to oblong-lanceolate, cuneate.
 - F. Leaves always entire, 4-7 cm. long; inflo. large and loose.
 - 12. *S. chinensis*
 - FF. Leaves 2-4 cm. long; infl. 5-8 cm. long.
 - G. Leaves unlobed. 13. *S. persica*
 - GG. Leaves 3-9 lobes. 14. *S. laciniata*
 - DD. Leaves pinnate, with 7-9 leaflets; infl. 3-7 cm. long; flowering branches usually with terminal bud developing into a leafy shoot. 15. *S. pinnatifolia*

1. *Syringa amurensis* (Rupr.) Rupr. var. *japonica* (Maxim.) Franch. & Sav.

A native of Japan, this plant was introduced into cultivation in 1876. The value of this species is in its white flowers which appear approximately three weeks later than the flowers of the common lilac. This species may be grown either as a shrub or as a small tree. When grown as a tree, it reaches heights in excess of thirty feet. When grown with this habit, the cherrylike bark is quite attractive. Caution should be exercised in the placement of this plant because some people find the odor of the flowers to be disagreeable. This variety has been considered to be a distinct species by some workers and, as a result, is offered by several nurseries under the name *S. japonica* Decaisne. This plant is offered for sale by the following nurseries: C1, C2, C3, C4, M1, M3, M4, M9, M10, M11, M12, M13, M14, N3.

2. *S. yunnanensis* Franchet

This species was introduced into cultivation from Yunnan Province, China in 1906. One of the less showy species, it is of value because of its late flowering. Its flowering period bridges the gap between the common lilac and the previous species. *S. yunnanensis* 'Rosea,' a pink flowering form, is offered for sale by C5.

3. *S. josikaea* Jacquin f. ex Reichenbach

The Hungarian Lilac was introduced into cultivation from Hungary about 1830. The flowers of this species are lilac-violet. It flowers at the same time as *S. yunnanensis*, but is slightly more showy. Nurseries offering *S. josikaea* for sale are: C4, M3, M4, M11, M12.

S. josikaea has been hybridized with other species in the development of new groups of cultivars. *S. josikaea* hybridized with *S. villosa* gives rise to the hybrid complex known as *S. × henryi*. A cultivar selected from this cross is *S. × henryi* 'Lutece.' This cultivar is offered under the name *Syringa* 'Henry Lutece' by M5.

The hybridization of *S. josikaea* with *S. reflexa* gives rise to the hybrid complex *S. × josiflexa*. 'Royalty,' a purple, single-flowered cultivar, has been selected from this hybrid and is offered for sale by N2.

4. *S. reflexa* Schneider

Originally discovered in Central China, this species was introduced into cultivation about 1882. Flowering at the same time as the preceding two species, this is a distinct and handsome plant with flowers in long, pendulous panicles.

None of the nurseries in the New England region offer this species for sale, although it is attractive and hardy. A hybrid with *S. villosa* resulted in the development of the complex *S. × prestonae*, the source of the Prestonae hybrids. The only cultivar of this hybrid swarm offered for sale here is 'Isabella,' a single flowered, pink form. This cultivar is sold by N2.

Hybridization of *S. reflexa* with *S. tomentella* has produced the cultivar *S. reflexa* 'Pallens,' offered for sale by C1.

5. *S. villosa* Vahl

Introduced into cultivation in 1882 from North China, this species is to be recommended for its dense habit and its late and profuse flowering. The flowers may vary in color from rose-lilac to white. The following nurseries offer this species for sale: C2, C4, M10, M11, M12, M14.

6. *S. tomentella* Bur. and Franch.

Wilson writes in his "Aristocrats of the Garden": "I saw this plant for the first time on July 5, 1908, on the frontier of eastern Tibet at an altitude of nine thousand feet, and I thought then that I had never before seen such a handsome species of lilac. It had foot-high, broad panicles of pink to rosy-lilac colored flowers and on other bushes they were white. The plants were from eight to eighteen feet high, much-branched yet compact in habit, and the wealth of flower clusters made it conspicuous from afar." Unfortunately, this species has not done well in our collections. One of its shortcomings is its lack of fragrance. The species is offered for sale by C1.

7. *S. sweginzowii* Koehne & Longelsh

This lilac was introduced into cultivation in 1894 from northwest China. One of the later flowering species, it is not often cultivated. A cultivar of the hybrid between this species and *S. tomentella* is the single, pink flowered *S. sweginzowii* 'Albida.' This cultivar is offered for sale by M12.

8. *S. velutina* Komar

Introduced into cultivation in 1902 from North China and Korea, this species is usually found in catalogues under a synonym, *S. palibiniana* Nakai. The latter name is incorrect and should not be used.

An unusually late flowering, pale lilac, single flowered cultivar of this species is 'Miss Kim.' This cultivar also is of interest because of its dwarf habit and red coloration of the leaves in the autumn. The cultivar is offered for sale by M2, N2.

9. *S. microphylla* Diels

A native of North China, this shrub was introduced into cultivation in 1910. This plant is of interest because of its small leaves. A cultivar 'Superba' with single, pink flowers is offered by the following nurseries: C1, C5, M5.

10. *S. vulgaris* L. var. *vulgaris*

In cultivation since 1563, the common lilac, a native of southeast Europe, is offered for sale by the following nurseries: C2, C3, C4, C6, M1, M2, M4, M5, M6, M8, M9, M10, M11, M12, M13, M14, M15, M16, N1, N2, R1, V1.

11. *S. vulgaris* L. var. *alba* Weston

The white flowering variety is offered by the following nurseries: C3, C4, C6, M1, M3, M4, M6, M8, M9, M10, M11, M12, M13, M14, M15, M16, R1, V1.

No species of shrub has produced so many cultivars as has *Syringa vulgaris*, the common lilac. These cultivars have arisen from sports, natural and artificial crosses within the species, and by selection, but not from the crossing of this species with any other. Many of these variants were first developed in France, which has led to the term "French Hybrid" being used for many of these cultivars.

Cultivars of *S. vulgaris* offered for sale

WHITE

Single

- Candeur M6, M12
- *Jan Van Tol C2, C6, M6, M11, M15, M16, R1
- *Marie Legraye C2, M1, M6, M11, M13
- Mlle. Fernande Viger M11
- *Mme. Florent Stepman M4, M9, M13
- *Mont. Blanc M2, M16
- Primrose (yellow) C1, M11
- *Vestale C11, M7, M9, M13, N2

Double

- *Edith Cavell M4, M11
- *Ellen Willmot C5, C6, M1, M3, M6, M11, M15, N2
- General Sheridan M9
- Mme. Abel Chatenay M15
- *Mme. Casimir Perier M6, M11, M13, M16
- *Mme. Lemoine C4, C5, M2, M3, M4, M6, M8, M11, M12, M13, M15, M16, N2, R1, V1
- Princess Clementine M13

VIOLET

- Maximowicz M11
- *Marechal Lannes M11

BLUE

- *Ambassadeur M5
- Bleuatre M4, M11, M12
- *Firmament M3, M8, M11, M12
- *Mme. Charles Souchet C1
- *President Lincoln C2, M1, M2, M6, M8, M9, M11, M12, M15, N2
- *Ami Schott C1
- *Duc De Massa M13
- President Grevy C2, C5, C6, M4, M6, M8, M11, M12, M13, M16, R1, V1
- *President Viger M1, M13

LILAC

- Hugo Koster C2, M11, M12
- *Jacques Callot M5
- *Alphonse Lavallee C4, C5, M5, N2
- *Leon Gambetta M1, M4
- Michael Buchner C2, C4, C5, M4, M15, M16
- President Carnot M4
- President Fallieres C2, M1, M5, M15
- William Robinson C2, M6

PINK

- *Lucie Baltet C6, M4, M8, M11, M13
- *Macrostachya M4, M6, M8, M11, M13
- *Belle De Nancy C5, C6, M3, M8, M13, M15, N2, R1, V1

Single

Double

- *Jean Mace C2
- *Jules Ferry M13
- *Katherine Havermeyer C2, M1, M2,
M4, M6, M8, M13, M14, M15,
M16
- Marc Micheli M5
- *Mme. Antoine Buchner M1, M14
Montaigne M2
- *Waldeck-Rousseau M4, M16, M17

MAGENTA

- Charles X C2, C6, M1, M3, M4, M8,
M11, M16, N2
- *Congo C4, M1, M2, M3, M4, M6,
M9, M11, M13, M16, N2
- *Mme. F. Morel C2, C4, M6
- *Reaumur C2, C4, M4
- *Rhum Von Horstenstein C4, M4
- Colbert M11
- *Mrs. Edward Harding C2, C5, V1
- *Paul Thirion M13, M15, N2
- *President Poincaré C2, C4, C5, M13

PURPLE

- *Diderot C2
- *Ludwig Spaeth C2, C4, M1, M4, M5,
M6, M8, M9, M12, M13, M15,
M16, N2, R1
- Philemon M5
- Sensation M15
- *Volcan C4, M11, M13
- *Adelaide Dunbar C5, M1, M15, M16
- *Charles Joly C2, C5, C6, M1, M3,
M4, M8, M9, M11, M12, M13,
M16, M17, N2, R1, V1
- *Monge M2, M5
- *Paul Hariot M5, M16

Hybrids between *S. vulgaris* and *S. oblata dilatata* form the dilatata hybrids. Members of this complex flower early in the season. Two cultivars of this group are sold in New England. Both are members of the one hundred best lilacs. 'Evangeline' is a magenta, double flowered form N2. 'Pocahontas' is a purple, single flowered form sold by N2.

Hybrids between *S. vulgaris* and *S. oblata giraldii* form the Giraldii hybrids. Members of this complex flower early in the season. An asterisk indicates plants listed as among the one hundred best lilacs.

Clark's Giant	Single	Blue	C4, M11
*Esther Staley	Single	Magenta	C4, M11
Pink Spray	Single	Pink	M11
Purple Glory	Single	Purple	M11
Summer Skies	Single	Magenta	M11
Sunset	Double	Magenta	M11

12. *S. chinensis* Willd.

Much confusion has occurred in the identification of the place of origin of this hybrid species. Wildenow's specific epithet shows that he thought the plant had originated in China. It appears, however, that this plant originated in the Botanic Garden in Rouen, France about 1777. The parents of this hybrid species are *S. × persica* and *S. vulgaris*.

S. × chinensis differs from *S. vulgaris* in that it does not develop the stiff upright habit found in the latter, and in the failure to form the heavy branches found in the common lilac.

Several nurseries sell this plant under a synonymous name, *S. rothmogensis* Poir. & Turp. *S. × chinensis* is sold by the following nurseries: C3, C5, M1, M6, M8, M9, M10, M11, M12, M13, M16, R1, R2.

13. *S. × persica* L

This species is of particular taxonomic interest. Linnaeus did not recognize the hybrid origin of this plant and described it as a species. This view was concurred with by most taxonomists until quite recent times. McKelvey held this view in her monumental work "The Lilac." There were some dissenters who were of the opinion that this plant was of hybrid origin. However, these workers were not able to agree upon the parents. Cytogenetic work has supported Rehder's opinion that the parents of this hybrid species were *S. afghanica* and *S. laciniata*.

This plant is extremely showy, bearing pale lilac flowers at the same time as the common lilac. It differs from the common lilac in its smaller size. *S. chinensis* was introduced into cultivation about 1614. Nurseries offering it for sale are: C3, C5, M1, M6, M8, M9, M10, M11, M12, M13, R1, R2.

The white flowered form, *S. chinensis* forma *alba* (Weston) Voss., is offered for sale by M1.

14. *S. laciniata* Miller.

A native of China, this plant was introduced into cultivation before 1620. It resembles *S. chinensis* closely, differing from it in its darker flower color and lacinate leaves. It was long thought to be a variety of *S. × chinensis*. The discovery of the plant breeding true in the wild, disproves this theory.

Cultivated for much the same reason as *S. × chinensis* and for its unique lacinate leaves. It is offered for sale by C1.

15. *S. pinnatifolia* Hemsl.

A native of western China, this plant was introduced into cultivation in 1904. The white flowers are not conspicuous, thus the plant is usually cultivated for its interesting pinnately compound leaves. As one of the first species to flower, it serves to start the season of lilac flowering. It is offered for sale by C1.

Key to Nursery Code

CONNECTICUT

- C1. Brimfield Gardens Nursery, Wethersfield
- C2. The Hoyt Nurseries, New Canaan
- C3. E. D. Robinson Sales Agency, Wallingford
- C4. The Peter Cascio Nursery, West Hartford
- C5. White Flower Farm, Litchfield
- C6. C. R. Burr & Co., Inc., Manchester

MASSACHUSETTS

- M1. Adams Nursery, Inc., Westfield
- M2. Dahliatown Nurseries, Middleboro
- M3. Littlefield-Wyman Nurseries, Inc., Abington
- M4. Heatherfells Nursery, Andover
- M5. Cary Bros. Nursery, Shrewsbury
- M6. The Framingham Landscape Co., Framingham Centre
- M7. Edward Halloran, Inc., Newton Highlands
- M8. Bigelow Nurseries, Northboro
- M9. Wyman's Garden Center, Inc., Framingham
- M10. Kelsey-Highlands Nursery, East Boxford
- M11. Weston Nurseries, Inc., North Abington
- M12. Bay State Nurseries, Inc., North Abington
- M13. Cherry Hill Nurseries, Thurlows and Stranger, Inc., West Newbury
- M14. Hampden Nurseries, Inc., Somer Road, Hampden
- M15. Corliss Bros., Inc., Gloucester
- M16. Marinus Van der Pol, Fairhaven
- M17. Eastern Nurseries, Holliston

NEW HAMPSHIRE

- N1. Exeter Wild Flower Gardens, Exeter
- N2. Landscape Clinic Nursery, Somersworth
- N3. Colprit's Nursery & Seed Farm, Dover

RHODE ISLAND

- R1. Forest Hills Nurseries, Inc., Cranston 10
- R2. C. Hoogendoorn, Newport

VERMONT

- V1. Putney Nursery, Putney

BURDETTE L. WAGENKNECHT

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A BOOKLET ON LILACS FROM RUSSIA

THE Russian pavilion at the World's Fair in Brussels, Belgium, in 1958 featured a large display of books published in languages other than Russian. Only one of the many books offered for sale in English proved to be of horticultural interest and that, titled "Lilac,"* was offered for fifteen cents. It was obvious that this pamphlet of 40 pages with a colored illustration on the cover and 13 text-figures and plates was a subsidized publication. Leafing through a copy I noted a seemingly amusing account of "Michurinist" methods of plant breeding culminating in the development of many new cultivars. Several of these are described and illustrated and their names should be recorded as new cultivars of *Syringa vulgaris*.

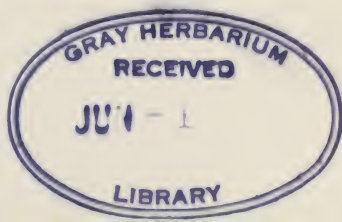
Recently our library received an unsolicited copy of the same pamphlet directly from Russia. The booklet, therefore, must be judged not as a souvenir item offered for sale at a World's Fair but as a treatise on the culture and breeding of lilacs. It is, as well, a confused bit of propaganda for the Michurin-Lysenko school of biological thought and practise. I know of no other single booklet which points out as well the current difference of theory and practise in horticulture and genetics between these sciences in the free world and in the Soviet Union.

The author is described in the publisher's note as L. Kolesnikov, an amateur floriculturist with 30 years of experience in hybridization and the winner of the Stalin Prize for breeding more than 300 new strains of lilacs.

The first half of the booklet describes the biological features, species and kinds of lilacs. The second half the breeding of native lilacs. The plants considered are grown in the vicinity of Moscow.

Throughout the booklet the author gives credit to the principles stated by I.V. Michurin and A. D. Lysenko. It is difficult to determine from the translation

* Lilac, L. Kolesnikov. Foreign Languages Publishing House, Moscow 1955.



whether this represents a sincere belief in the principles and practises described or only lip service to a state-directed theory of biology. Many of the tenets proposed have double meanings which are at odds with Michurinist principles and frequently it seems the author, or the translator, has his tongue in cheek.

For culture of lilacs the author recommends a sunny location with adequate drainage. Lilacs do best, he says, in well fertilized soils. He credits Michurin with the idea that "worn out soil and lack of due care will weaken the plant and cause its degeneration, retarding the growth of the shrub and its flower-shoots, florets and panicles deteriorating in size with a change to the worse in their colour." Liming, he suggests, may be necessary in acid soils. The best fertilizer is well rotted stable dung although "peat-night-soil and other composts" or chemical fertilizers may be added. Manganese and boron are stated to be minor elements necessary for growth and for improved flower color.

Kolesnikov found lilacs easily propagated by seed, grafts, root suckers, cuttings and layering. The best stocks he reports are *Syringa josikaea* and *S. vulgaris*, particularly the violet-flowered forms raised from seed. Several types of grafting are suggested but he notes that "one must bear in mind Michurin's indication of the strong mutual influence between graft and stock. This practically infers that the eye or scion should be taken from the older strains with a firmly established character. Such strains are much better proof against the influence of the stock." This is based, of course, on the unsupported Michurinist idea that both the scion and the stock could have their heredity modified by grafting and that the more vigorous strain would not only dominate but influence the heredity of the other as well.

Kolesnikov reports that scions in his area may be taken in the fall and stored until spring. He believes he obtains a greater success in grafting if the scion was a little withered when grafted for "this guarantees better nourishment for the graft and its better union with the stock."

Culturally most of the plants were grown to a single stem by careful pruning and Kolesnikov speaks with pride of having grafted 24 different varieties on one stock plant. The color cover illustration is of this plant in flower.

Kolesnikov also reports a technique of "twig grafting" where branches 1-10 inches long are taken with a bit of the main stem as a heel and the whole used as a scion. It seems important that these branchlets be taken in the fall and allowed to over-winter either beneath the plant in the field or in cold storage. The branchlets must not be watered and the buds are allowed to shrivel. According to him, grafting can be done with these in the spring from the time the sap begins to flow until the end of the flowering period. If flower buds are on the branchlets the graft will flower the first year.

These cultural principles are considerably different from those used either at the Arnold Arboretum or in any part of this country. Our own practises in propagating and caring for lilacs will be discussed by Mr. Fordham in this same issue

of *Arnoldia*. Perhaps some of Kolesnikov's methods should be tried for comparison of results.

In his discussion of breeding new lilacs Kolesnikov reports he took up lilac breeding in 1919 and by 1923 had 100 species and strains in his collection. In his early work he gathered seeds from the best shrubs which had been pollinated by insects and selected the most attractive progeny and rejected the worst. While this method has produced results in the past and may be used by the "florist beginner" Kolesnikov cryptically reports "in the present level of Soviet science this may not be the principle course to choose."

Sometime after 1923, Kolesnikov was introduced to Michurinist teachings and he resolved then to start breeding new native kinds of lilacs. He states, "I found a plant breeder needs much more than the mere desire to breed new varieties. He must first of all be well-read in the science of selection. As for myself, I continually felt how much I lacked such knowledge. So I got down to a thorough study of Timiryazev, Michurin, Lysenko and their followers. The work of the founders of Soviet agrobiolgy became my everyday friends and advisors. And to them, I still turn today when unable to solve some problems and always find a clear and adequate scientific explanation."

Kolesnikov is less than able in presenting a clear explanation for the reader. He states, "Michurin biology, having worked out methods of controlling plant-development, of producing purposeful changes in the nature of vegetable organisms, offers us the only true means of remodeling plants.

"There are three main stages in the process of Michurinist selection all of them inseparably bound. The first is disjointing the plant's heredity, the next rearing the plant thus acted on, and the last, artificial selection, which secures the desired characters and properties.

"Michurinist plant-selectors achieve their aims by means of sexual and vegetative hybridization, subjecting plant organisms to deliberately modified environments. Mutually complimentary, these methods combine in logical unity."

Kolesnikov has proceeded along the principles which, one must suppose, are clear to him. His techniques of emasculating the flower, collecting the pollen and protecting the pollinated pistil are standard and sound. However, he soon confuses the reader by suggesting variations which he has tried. Michurinist plant breeding leaves nothing to chance, so Kolesnikov explains enigmatically, "In natural pollination, self-or insect-made, the pollen sets on the stigma, which starts the complex process known as fertilization. But the method used by Michurinist science in developing new plant-forms is artificial pollination effected between plants chosen for crossing." The author reports further that "in theory as in practise I. V. Michurin proved that the habits and characters of plants depend as much on the actual conditions of their life as on predisposition inherited from their parents and ancestors." While Michurin has maintained that the transmission of hereditary characters depended on the comparative vigor of the

two parents Kolesnikov goes one step further in trying to equalize this by explaining "I sometimes first endeavor to establish a closer affinity between the two plants by grafting one on the other. They flower side by side and long before crossing are already closer related as parts of one plant. After this crossing itself takes less time than usual." While Kolesnikov pays lip service to "purposeful crossing" he also admits "I also resort to pollenizing with a mixture of pollen from several of the best strains. Such practise, as testified by science, is of general biological benefit to the flower." All of this is in contrast to another of Kolesnikov's principles for he states "Michurin has pointed to the danger of the stock, often a wilding, having a bad effect on the hybrid embryo germinating in the mother plant. For this reason I always choose my parent pairs from own-root strains."

As examples of his purposeful rearing of the hybrids Kolesnikov implies adherence to Lysenko's basic theory of plant development by which a change in the plant's characteristics can be made in a definite direction by creating specific conditions at a particular moment in the development of the organism. Kolesnikov believes that "at its earlier stage a young hybrid is extremely pliant and easily succumbs to the influence of its surroundings." While the majority of his hybrid seedlings are carefully nurtured "a certain number are put in worse conditions to inure them to hardships which the selector intends them to encounter in the future." He states "the plant selector is able to change its heredity in the manner he wants by exposing it to appropriate conditions of soil, nutrition, temperature, etc."

Even after the heredity of the line is altered, in Kolesnikov's eye, by these applied environmental influences, the experimenter is not through. He describes one step in increasing the fertility of a double strain of lilacs by reducing the doubleness through starvation, a process we have never observed even in the most neglected lilacs of old New England farms. Kolesnikov reports "It is known, for example, that the more double the flower the fewer and feebler are its stamens and the weaker its pistil, which is naturally a great hinderance to artificial pollination. My remedy is to sustain them for a year in severe conditions, having shortened their roots and transplanted them into less nutritive soil." The flowers, he reports, become less double and more fertile and can be crossed, and, by rearing their progeny in excellent surroundings, "these seedlings again restored their ancestor's doubleness or even surpassed them."

If the seedlings of a cross were not successful they were not discarded as they might have been in Kolesnikov's pre-Michurin days, for he states, "I never forget that the first flowering may not bring out all their merits. Many of them may yet be successfully improved or modified if given appropriate conditions. In such cases I often resort to Michurin's method, grafting the hybrid's heads with a strain I consider will weaken or strengthen this or that feature."

Kolesnikov concludes his booklet with the statement, "Michurinist biology

equips the selector and originator of new varieties with a sure and powerful means of remodeling plants. With a profound knowledge of Michurinist methods and properly applying them, the experimental florist will certainly win success in the noble and exciting art of developing new strains of flowering and ornamental plants."

"Lilac" by Kolesnikov is indeed a sad commentary on the state of plant genetics and plant breeding in the Soviet Union. Nearly every quotation given in this paper is subject to correction on the most simple elements of botanical and horticultural science. Doctrines such as Kolesnikov expresses might have been acceptable 200 years ago. They are not today. I sincerely hope that an American who bought a copy of the Lilac booklet at Brussels or who has received one since will recognize it as a ludicrous parody whether or not the author so intended it to be.

The following cultivars of *Syringa* are described and those with an asterisk are also illustrated: 'Alexi Maresiev'*, 'Dream'*, 'Ivan Michurin', 'Jambul', 'Leonid Leonov'*, 'Morning in Moscow', 'Olimpiada Kolesnikova'*, 'Polina Osipenko', 'S. M. Kirov', 'Zoya Kosmodemyanskaya'. As will be noted from the "techniques" and "principles" quoted above, their parentage is presumably quite unknown.

RICHARD A. HOWARD

PROPAGATION AND CARE OF LILACS

LILACS, though rugged and persistent under adverse conditions, will respond admirably to good culture. They thrive in a wide variety of soils in a pH range of 6.0 to 7.5 with preference for a well drained situation and full sun. They will not, however, tolerate wet locations.

In a remote section of the Arnold Arboretum there are two clumps of lilacs growing in a shallow pocket of rocky soil atop a pudding-stone ledge. Nearby are the remains of an old well, indicating that a dwelling existed at this location. It seems reasonable to suppose that these lilacs were planted by the occupants before the property was acquired by the Arboretum. If this assumption is correct, these plants have persisted under conditions of extreme adversity for over eighty years without attention.

Plate III depicts a thirty-five-year-old own-root lilac. By a program of systematic pruning, this multi-stemmed specimen is kept in a condition of constant self renewal. Each year or so a few of the older stems are removed to ground level and the new shoots are thinned and spaced to furnish future replacements. Should an occasional stem succumb to borers, which affect only the larger stems, the loss is of no great consequence. However, in the case of single-stem grafted plants it could result in complete loss. Another aspect of this pruning system is that better flower color and size are maintained. Lilac plants when permitted to attain large dimensions show a reduction in size of the flower and a lessening of its color intensity. For obvious reasons this method of lilac care is feasible only with specimens growing on their own roots. A good practice is to remove flower clusters after they have finished blooming. The nutritive materials which otherwise go into the formation of unwanted seed are thereby conserved for the plant. Lilacs which are not permitted to form seed, also flower more profusely the following year.

Plate IV shows a grafted plant of *Syringa vulgaris* 'Paul Thirion.' In one year this scion has developed sufficient roots to permit removal of the privet understock.

Plate V illustrates the incompatibility of lilac and privet by vigorous overgrowth of the scion. This one-year-old graft was planted with the union at ground level, giving the scion no opportunity to initiate its own roots. In a few years,



PLATE III

Thirty-five-year-old own-root lilac maintained in a condition of self renewal by a program of systematic pruning.

plants in this condition are inclined to display stunted growth and a starved appearance. These symptoms are usually followed by failure resulting from incompatibility of root stock and scion.

Plate VI shows a two-year-old *Syringa swegiflora* which has reached a point of own-root development where the privet rootstock (indicated by arrow) is of no further consequence. In transplanting, it could be removed, but if disregarded, would undoubtedly perish of its own accord.

INSECTS AND DISEASES

This information appears in *Arnoldia*, Volume 19, Nos. 1-2, March 6, 1959.

PLANTING

Planting of lilacs is best done in spring or fall while the plants are dormant. Fall has some advantage over spring, as root activity which occurs then establishes the plant for a good unchecked start with spring's arrival. However, container-grown and small plants will thrive if carefully moved with a ball of earth anytime throughout the summer and are given adequate aftercare.

As with all planting of trees and shrubs, the preparation of the hole to receive the plant cannot be overemphasized. A hole several times larger and deeper than the root system should be a minimum requirement. Careful preparation of the backfill is important, as once done, it becomes a permanent medium, out of sight, out of mind, and not changed again. Organic matter, such as rotted manure or compost, generously mixed with good soil provides a friable moisture-retaining medium that, with systematic fertilization and water, will serve the plant indefinitely.

An effort should be made to maintain the previous root level, easily determined by locating the line of demarcation on the lower stems, which indicates the parts previously above and below ground in the nursery. Planting too deep or too shallow will retard growth while the plant forms new roots at its own most favorable level.

A most satisfactory way to backfill is to bring well-firmed soil up to a depth equal to the lower level of the roots, place the plant in the hole with roots outspread in a natural manner, fill it with water and slowly add the prepared soil mixture. This method completely compacts soil around the roots, eliminating all possible air pockets without the root damage often involved as a result of firming by foot. Finally, a ring of earth around the outside edge of the hole forms a saucer which catches and prevents water from escaping. Mulching might be of benefit the first year while the plant is becoming established, but after that its value is dubious, as lilacs form superficial roots which would grow in the mulch, forming, in time, a troublesome water-shedding mound elevated above the surrounding terrain.

If the root system has been reduced excessively in the digging process, some reduction of the top becomes necessary in an effort to balance top to root. An



PLATE IV

Arrow indicates roots which this lilac scion has developed in one year.

important point to be considered when arriving at this balance is the fact that excessive pruning reduces any plant's digestive and respiratory facilities, often to the point of serious retardation.

SOFTWOOD CUTTINGS

Softwood cuttings are perhaps the most satisfactory way of increasing lilacs. With some exceptions, they are ready for potting in about seven weeks, producing own-root plants not subject to the complications often encountered with grafts.

With the advent of mist systems and moisture retaining plastic case coverings, collection of lilac cuttings no longer requires the critical timing once necessary. Propagators previously determined "proper time" by flexing the cutting between their fingers; the rule-of-thumb method being to take material when the wood reached a point where it snapped instead of collapsing when sharply bent. Through trial and error, cuttings at this stage of lignification were found to root best. However, with modern facilities this time has been advanced and we now succeed with softer material taken when it reaches sufficient size to make a cutting. We have found, however, that wood taken too late will sit in the propagating cases for weeks on end, rooting in mediocre percentages or petering out entirely.

In selecting lilac cuttings, vigorous shoots with long internodes are avoided and only normal growth is chosen. An effort is made to gather the cuttings early in the morning before much transpiration has taken place and the wood is in its freshest and most turgid condition. Material collected in this manner and placed in closed bags, shielded from the sun, will be in prime condition. In the event that insertion cannot be made on the day of collection, the closed bags may be stored in a refrigerator at about 40° F. for several days without deterioration.

At the Arnold Arboretum cases are used composed of 2 mil. polyethelene plastic film supported on a framework of welded joint wire of 2x4 inch mesh, known as turkey or utility wire. Bottom heat is maintained at 75° F. by electric heating units. Shading is accomplished by roll type shades on the greenhouse, supplemented at midday for about two months, when the sun is at its highest, with additional shading of saran cloth hung two feet over the propagating case. This shading is timed to reduce the build-up of trapped heat in the cases with the least reduction of light intensity.

Treatment of softwood lilac cuttings is in the following manner: An oblique cut is made slightly below the nodes and the bottom pair of leaves are removed. If the tip is soft and rubbery, this too is nipped off, as it might decompose in the case inviting fungus infection. Cutting bases are dipped in Hormodin #3, which is composed of 8 milligrams of indolebutyric acid to 1 gram of talc, and are then tapped to remove any surplus. The medium to receive these is washed sand purchased from a local gravel pit. Though finer in particle size and not as sharp as we would prefer, it serves the purpose. Cuttings are inserted to a depth of about one and one half inches in rows, spaced so as not to touch one another. A very



PLATE V

Incompatibility of lilac and privet is depicted by overgrowth of the scion. Had the union been planted deeper the scion might have initiated roots.

thorough soaking at this time compacts the medium around the cuttings and constitutes the initial watering. Finally, the polyethelene covers are placed over the cuttings, making certain that they are airtight. Success with this method of propagation depends completely on how well the cuttings are covered, as air leaks on dry days can reduce the necessary high humidity, causing failure.

On cloudy, humid days all coverings are removed as routine procedure and the cases are checked for fallen leaves and dead cuttings, which are removed as a sanitary measure. Should the day remain close and humid, the coverings are left off all day. Before again covering the cuttings at night, a spray application of 50% "Captan" at the rate of two teaspoons to the gallon of water is made.

An inspection every few days reveals whether or not the medium is drying out, fungus infection is occurring, or insects have hatched from unnoticed egg masses which may have entered the case on cuttings.

When properly timed, treated, and handled, the lilacs are ready for potting in about seven weeks. After potting or boxing, material rooted under these humid conditions must be converted to greenhouse atmosphere in a gradual manner. This is accomplished by again covering them with polyethelene film. On cloudy, humid days it can be completely removed, and after several such days occur in succession, the transition will be complete. Otherwise, uncovering at night and covering in the morning, gradually increasing the uncovered period, will accomplish this very necessary conditioning.

HARDWOOD CUTTINGS

Lilacs can be rooted from winter cuttings, but so slowly and in such small percentages that this method seems unworthy of consideration.

LAYERS AND DIVISIONS

These methods which are applied to a limited extent commercially provide a simple means by which an amateur can increase his lilacs.

On observing lilacs, many plants can be seen with sections that can be separated from the parent plant with a spade. Divisions of this kind, can, with a minimum of attention, become flowering specimens in a few years.

Layering is performed by bending a branch down into a small trench about 3 or 4 inches deep and securing it about 12 to 15 inches back from the tip with a forked stick, bent wire or any means that will hold it in place. Shaving the rind from the under side for a distance of several inches at the point where it is pegged, will stimulate cell activity and aid in inducing roots. Next, the soil is replaced, the tip is bent upright and preferably staked. Should the soil be of too heavy a texture, a medium composed of two parts sand, one part peat and one part soil is substituted. If done in the early spring and kept moist, the layer might have a root system adequate to permit severance from the mother plant after one grow-



PLATE VI

Scion of this two-year-old lilac-privet graft has developed roots to an extent where the privet is of no consequence. Arrow indicates proportionately small remaining understock with dead stubs at its base.

ing season, but it is more apt to require two. This can be easily determined by carefully removing enough earth to observe the size of the root system.

SEED

Seeds have a dormant condition that can be overcome by a period of cold stratification. This is accomplished by storage in a refrigerator at approximately 40° F. for one to three months in a polyethylene bag with a slightly moistened medium of sand and peat, or by fall sowing out-of-doors. We favor the former method, as it obviates the necessity of having to furnish protection from the destructive action of vermin. Species lilacs will come true from seed if they are not grown in the proximity of others where cross pollination might occur. Cultivars will not produce true types from seed.

GRAFTING

As with all our lilac propagation, we approach grafting in an attempt to obtain own-root specimens free of the troubles which often beset grafted plants. Understocks are considered as temporary, to function only until the scion has developed a root system sufficient for its own support.

Bud grafting has the disadvantage of buds being placed high on the stock, making it extremely difficult, if not impossible, to plant deep enough to induce the scion to initiate its own roots. We do this, on occasion, as a temporary measure to carry material received too late in the season for cuttings, but only with the intention of repropagating, preferably by cuttings, as soon as possible. This temporary storage of material can be done on any lilac or privet available in the nursery.

Use of *Syringa vulgaris* as a rootstock meets with immediate objection because of its treachery. Most lilacs by nature spread vigorously from suckers and this understock could, unless carefully watched, easily outgrow the scion without ever being noticed.

In the climate of Boston, *Ligustrum ovalifolium* qualifies as suitable understock for this method of producing own-root lilacs. The past winter in this area was one of persistently low temperatures, without snow cover, causing abnormally deep frost and extensive damage to plants. However, on digging several hundred lilacs grafted on *L. ovalifolium* this spring, no injury to the stock was observed. One-year-old rooted hardwood cuttings of *L. ovalifolium* are obtained from nurseries which mass produce them at a cost making it more practical to purchase than to raise them. Storage is achieved by heeling in out-of-doors in a deep frame, cold enough to keep them dormant yet warm enough to prevent freezing of the ground, so they will be readily available when needed.

Scions may be collected anytime throughout the winter as they are to be used, or can be stored in tightly-closed polyethylene bags with a small amount of slightly-moistened sphagnum moss at about 40° F. in a refrigerator. Scions are

maintained in a condition as fresh as possible: this method preserves them for many months in a state comparable to newly cut material.

A whip-and-tongue graft is made using a scion about 6 or 7 inches long and an understock perhaps $1\frac{1}{2}$ inches in length. Rootstocks are kept short to facilitate the deep planting imperative with this method. Completed grafts are bound with rubber budding bands and then are placed deep enough to conceal the union in a moistened medium such as sphagnum moss, peat moss or sawdust. This procedure, known as callusing, can be controlled with a variance of temperature. Should a fast knitting of the union be desired, a temperature of 70° F. would create it in ten days. Grafts made early in the season can be callused slowly at lower temperatures. For example, grafts done in January would require about eight weeks to knit at 40° F. Once callused, they are kept cold enough to prevent further development until planting time.

In spring, when the ground warms up and the nursery becomes workable, the soil is prepared with a rotary hoe set at its greatest depth to facilitate deep planting. Budding bands are removed and the grafted plants set in rows spaced a foot apart with unions buried to a depth of about four inches. As with softwood lilac cuttings, grafts too will show variable results. Many grafted scions form roots quickly, some do so slowly and others resist.

ALFRED J. FORDHAM

PLANT COLLECTING IN THE SOUTHEASTERN UNITED STATES

Dr. Kenneth A. Wilson and the writer have recently returned from a month-long, 4000-mile trip involving collecting and field studies in connection with work toward a flora of the southeastern United States. In the course of this travel, areas in Tennessee, Alabama, Florida, Georgia, and South and North Carolina were visited, herbarium specimens and specimens preserved in alcohol were collected, and a number of living plants were sent to the Arnold Arboretum to be added to the numerous southern plants in the living collections. Among the plants collected for trial are clones of *Liriodendron*, *Calycanthus*, *Philadelphus*, *Malus*, *Amelanchier*, *Robinia*, *Lonicera*, and *Diervilla*, mostly from northeastern Alabama, an area of particular interest to plant geographers. Lying as it does at the southern end of the Appalachian system in an area of moderate climates and with a diversity of habitats, this region has an accumulation of a number of interesting and rare plants. Without trial it is often quite impossible to predict whether or

not a given species will be hardy in more northern climates, and sometimes surprising results are obtained. (Thus, *Franklinia alatomaha*, known only from a single locality on the coastal plain of Georgia and now extinct there, thrives as far north as eastern New England, and *Neviusia alabamensis*, long known only from a restricted area in Alabama but now recorded from Arkansas, is perfectly hardy in gardens in the Boston area.)

Like prophets, native plants are often without honor in their own lands. Almost everywhere, the exotic, the unfamiliar, will be grown in preference to beautiful, but familiar, plants native to a given region. To a considerable extent this attitude is still seen in the eastern United States, although, happily, more and more recognition is being given to some of the excellent trees and shrubs which flourish so well within the wide range of climates found in this broad area. Thus, although one has yet to see much evidence of the enthusiasm of the English for our native species of *Solidago* (goldenrod), it is hopeful to see the handsome evergreen species of *Myrica* gradually coming into use in the South, and such plants as *Phlox subulata*, *P. divaricata*, *Cornus florida*, and *Cercis canadensis* are grown almost everywhere in the East. Other native trees and shrubs are becoming more and more important horticulturally, and, through the efforts of individuals such as Mrs. J. Norman Henry, of Gladwyne, Pennsylvania, who has assembled from the wild an exceedingly fine collection of native American plants, many excellent ornamental plants are gradually drawing the attention they deserve in the country of their origin. Among the native trees, mostly from more southern climates but now familiar in New England gardens, are *Oxydendrum*, *Liquidambar*, *Halesia carolina* and *H. monticola*, *Cladrastis lutea*, *Robinia viscosa*, and *Catalpa speciosa* and *C. bignonioides*. Shrubs include *Calycanthus*, *Fothergilla*, *Hydrangea*, *Robinia hispida*, *Stewartia ovata*, *Franklinia* (this is a tree in more moderate climates), *Rhododendron carolinianum*, *R. catawbiense*, and an increasing number of the deciduous rhododendrons (*R. calendulaceum*, *R. nudiflorum*, *R. atlanticum*, etc.), *Leucothoe editorum* (*L. catesbaei*), *Pieris floribunda*, and others. Species of *Viburnum*, *Cornus*, *Ilex*, *Vaccinium*, *Robinia*, *Calycanthus*, *Magnolia*, *Rhododendron*, *Amelanchier*, *Malus* and *Aesculus*, among others, deserve to be more widely recognized. Further exploration, especially in the southern Appalachians and adjacent areas will undoubtedly yield many excellent selections to be added to the list.

C. E. WOOD, JR.

ARNOLDIA



A continuation of the
BULLETIN OF POPULAR INFORMATION
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VIBURNUMS

WITH some 96 species and varieties of viburnums growing in the collections and nurseries of the Arnold Arboretum, one would think there might be a bewildering number of these excellent plants from which to choose specimens for landscape planting. Actually there are only about 30 which are sufficiently ornamental and hardy to be considered worth while for planting in Hardiness Zones 4 and 5. If one were to put a premium on red- or yellow-fruited forms, there are only three yellow-fruited viburnums and ten of the red-fruited sorts; although there are several of the blue-to-black fruited viburnums, the fruits of which turn red at some time during the maturing process.

So, with a comparatively small number from which to choose, one might take a close look at these plants and the reasons for growing them as ornamentals, for they are outstanding in any garden where they are given the space to be properly displayed.

In order that the critical reader will know which types have been considered in this study, the species and varieties that are being grown in this country at present will be mentioned, with the reasons why some species, native and exotic, have not been deemed worthy of more consideration. It might be said, in this respect, that someone must decide, in any such study, which plants make the best ornamentals; and when a single individual does this (the author, in this case), there is obviously plenty of opportunity for disagreement by others. Be that as it may, the following selections will certainly give food for much thought and may be the basis on which others can make their own selections for their own purposes.

For Flowers

There are three general types of flowers among the viburnums: One bears a flat cluster several inches in diameter, made up of hundreds of small individual, perfect flowers that are usually creamy white in color. The snowballs are those

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with rounded clusters of all sterile flowers that do not bear fruits. Finally, there are those plants with flat clusters made up of all fertile flowers in the center of the cluster, but surrounded with large sterile or ray flowers on the perimeter. These are not necessarily the most conspicuous either, for when a plant of *Viburnum dilatatum* is literally covered with clusters of all fertile flowers, it is just as conspicuous in the landscape as is one of the snowballs.

The viburnums usually flower well every year, although they may not bear heavy crops of fruit annually. In the first place, wind and insects must be operating at the time the pollen is ripe; and, if during this period the weather is cold or rainy, little pollination occurs and hence fruiting will be sparse. The gardener usually loses sight of this fact by the time fall comes and the fruits are then conspicuously absent.

Some species (*V. dilatatum* is certainly one) should be planted in groups of several seed-grown plants to insure proper cross-pollination and hence good fruiting. In many cases of isolated specimen plants, poor fruiting may be traced to lack of sufficient pollen of the right type. Undoubtedly, there is a certain amount of cross-pollination among the species, but certain species are not as good pollinizers as others. Until more is known specifically, it is best to plant several seed-grown plants together or at least on the same property.

Four of the earlier-blooming viburnums should be considered together, since they are competing with each other for prime space in the early spring garden. *Viburnum carlesii* is the old-fashioned favorite that is hard to discontinue as it is so fragrant and so many people have come to like it. However, the fact remains that this is frequently susceptible to a disease which can kill mature plants quickly, even after many years of normal growth. It is the most fragrant of the four.

Viburnum burkwoodii originated in the nursery of Burkwood and Skipworth, Kingston-on-Thames, England, in 1924, as a hybrid (*V. carlesii* × *utile*). The flowers are fragrant, but not as fragrant as those of *V. carlesii*, and the leaves are smaller and more glossy. In certain parts of California it is proving evergreen, but in the Arboretum it is entirely deciduous. We started growing a plant between the greenhouses in 1931 and it is now nine feet high. Other plants in the collections are proving perfectly hardy. The habit of growth is somewhat open, not dense and compact.

Viburnum juddii originated at the Arnold Arboretum in 1920 as a hybrid (*V. carlesii* × *bitchiuense*) and is proving popular, having better foliage than *V. carlesii* but not quite as fragrant flowers, and being more dense in habit than *V. bitchiuense*.

Viburnum carlcephalum is proving very popular in this foursome. Originating in the nursery of Burkwood and Skipworth in 1932, it has been in America only a few years (but long enough to become patented). It is a cross between *V. carlesii* and the Chinese snowball, *V. macrocephalum*, which is not reliably hardy in New England. However, this hybrid is hardy, apparently, and makes a very dense

shrub with foliage quite similar to that of *V. carlesii*. The flower clusters are rounded, often up to five inches in diameter, fragrant, but not as fragrant as those of *V. carlesii*. The flower buds are pinkish, but the flowers open pure white. As far as we have seen, none of these last three mentioned species has proved susceptible to the graft blight disease, and any one of them, especially *V. carlesii*, might be selected as an early-flowering substitute for *V. carlesii*.

At least three viburnums have flat clusters of all perfect flowers which are borne profusely and make quite a display each year. They are *V. dilatatum*, *lentago* and *sieboldii*. Others, like *V. dentatum*, are also meritorious, but none surpasses those mentioned.

In the group bearing flat clusters of fertile flowers surrounded with large, sterile ray flowers could be *V. opulus*, *sargentii*, *trilobum*, and *V. plicatum* varieties *tomentosum*, *mariesii* and *roseum*. All of these are good for other reasons as well as for their flowers.

Viburnum plicatum roseum has sterile flowers on the outside of the cluster which open white at first; then, under certain soil or climatic conditions, gradually fade to a deep and very conspicuous pink. This color can vary in intensity (on the same plant)—probably depending on changing soil or even climatic conditions. In other words, we have not found it to be reliably pink every blooming season.

There are only three snowballs: The Chinese snowball, the largest, is not reliably hardy here. The European snowball (*V. opulus roseum*) frequently becomes so infested with plant lice that it is not worth the effort of growing. The least hardy—but the best—the Japanese snowball, *V. plicatum* (formerly *V. tomentosum* sterile), is the only one worth growing in the North. This is commonly available from nursery sources, and there is even a variety offered by the Wyoming Nurseries of Cincinnati, Ohio, which bears pink sterile flowers instead of white. Whether or not this color holds when the plants are grown in all soils, I do not know, but from color pictures I have seen, this clone must have merit.

The Order of Bloom

This is the sequence in which the viburnum species bloom in the Arnold Arboretum:

Early to Mid-April

fragrans

Early May

buddleifolium

burejaeticum

furcatum

lantanoides (*alnifolium*)

rhytidophylloides

schensianum

Mid-May

bitchiuense

burkwoodii

carlesii

juddii

lantana

veitchii

Late May

betulifolium

Late May (cont.)

bracteatum
carlcephalum
erosum

lentago

macrocephalum

opulus

opulus roseum

orientale

plicatum (tomentosum sterile)

plicatum mariesii

plicatum tomentosum

rafinesquianum

rhytidophyllum

rufidulum

sargentii

setigerum aurantiacum

sieboldii

trilobum

urceolatum

wrightii

wrightii hessei

Early June

cassinoides

dentatum

dilatatum

hupehense

lobophyllum

prunifolium

ovatifolium

scabrellum

Mid-June

acerifolium

bracteatum

molle

pubescens

For Fruits

As previously noted, there are three yellow-fruited forms, *V. opulus xanthocarpum*, *sargentii flavum* and *dilatatum xanthocarpum*. All are good, the first two being somewhat similar in the size of individual fruits and fruit clusters, and, in fact, the general habit of the shrubs themselves. *Viburnum dilatatum xanthocarpum* has smaller fruits but in much larger, flatter clusters.

Red-fruited forms include *V. lantanoides*, *dilatatum*, *opulus* and its variety *compactum*; *sieboldii*, *trilobum* and its variety *compactum*; *wrightii* and its variety *hessei*. One other species, *V. setigerum aurantiacum*, has been considerably written about in the past for its orange fruit. However, in all the many years it has been grown in the Arnold Arboretum, it has not made a good specimen plant, being very open and leggy at the base. True, the fruits are colorful for the short period they are conspicuous, but it does not seem advisable to recommend this because of its poor growth habit.

Really blue fruits are borne by the arrowwood, *V. dentatum*.

The black-fruited species are *V. acerifolium* and *lantana*. There are others like *V. sieboldii*, *plicatum* varieties, and *veitchii*, in which the fruits are black at maturity, but in ripening, they go through a stage when they are red and at that time, are most interesting. Truly black fruits can not be seen very far, but red fruits can, and so these we value especially during this ripening period. Usually, with *V. sieboldii* and some of the others, the fruits are red for some time, and as soon as they turn black, sometimes just before, they are taken by the birds.



PLATE VII

Viburnum plicatum mariesii in a garden in Ireland, of merit for its excellent horizontal branching.

Finally, there is a group with fruit at maturity a blue-black, but in ripening these will go through a most colorful change from green to yellow to red to blue-black—sometimes with all these colors apparent in one cluster at the same time. These would be *V. cassinoides*, *lentago*, *prunifolium* and *rufidulum*; all of them are excellent.

The early-flowering species—*V. burkwoodii*, *carlcephalum*, *carlesii*, *juddii* and *rhytidophylloides* have not fruited very well in the Arboretum. This may be due to inclement weather at the time the pollen is ripe or the lack of other pollinizing plants in the near vicinity. It is also due to the fact that these fruits are black; are usually hidden well under the new growth; and because they ripen so early in the summer, when few other plants have ripened fruits, the birds eat them before they are noticed. In any event, these are not recommended primarily for their fruits.

For Shade

Viburnum acerifolium, *lantanoides* (*alnifolium*) and *cassinoides* are the best for shaded situations; in fact, the first two must have a cool, moist, shaded situation or they can not be grown at all. If such a place is not available, these two should not be tried.

For Foliage

Siebold's viburnum is the best of all for foliage alone. Its large, dark-green, deeply-rugose leaves appear in clusters on the branches so that there are open spaces without foliage, lending a most pleasing aspect to the plant as a whole. Then, the long leaves of *V. rhytidophylloides* (formerly *V. lantanaphyllum*) are also good, possibly the 'Willow Wood Seedling' being the best clone of this hybrid species. The wayfaring tree, *V. lantana*, is not grown much any more, but its variety *rugosum* is a very good form, with rugose, slightly glossy, dark-green leaves that have none of the light green color of the species. Other viburnums also have handsome foliage, but those just mentioned might be considered the best for this purpose.

For Habit

Some viburnums can be grown with a single trunk and will eventually grow into small trees as much as thirty feet tall. These would be *V. lentago*, *prunifolium* (which incidentally is about the best for a vivid scarlet autumn color), *rufidulum* and *sieboldii*. One variety, *V. sieboldii reticulatum*, is supposed to be lower in habit, but our plant is yet too small to assess it properly.

The lowest form is *V. opulus nanum*, seldom exceeding two feet in height, even though it may grow five feet across. It has never flowered in our collections, and normally can not be expected to flower. There are also dwarf forms of *V. fragrans* which do not flower with us but make low, compact plants. Shrubs about five or six feet tall would be *V. opulus compactum* and *V. trilobum compactum*, but I am not at all certain that these two differ. They are dense in habit and branching,



PLATE VIII

Viburnum plicatum roseum. The petals of the large sterile flowers on the perimeter of each cluster open white, but some years they gradually fade to an excellent pink.

and do flower and fruit. *Viburnum wrightii hessei* is also lower in growth than the species. Most of the other viburnums are shrubs six to twelve feet tall.

In discussing viburnums for habit, the varieties of *V. plicatum* certainly should be mentioned, for *mariesii*, *plicatum* 'Lanarth' and *roseum* all have a horizontal branching habit, bearing their flat clusters of flowers and fruits on the upper side of each branch, making the plants stand out from most other shrubs one sees in landscape plantings. I have seen old plants of *V. plicatum mariesii* in Ireland about seven feet tall, but they were over fifteen feet in spread, easily twice as wide as tall.

Not Recommended

Those species and varieties already discussed are among the best of the large group that is hardy here in the North. Merely for the record, to show other species and varieties either not hardy or which are grown but not found superior as ornamentals to those already mentioned, the following list is offered:

NH = Not hardy in the Arnold Arboretum

A = Differs little from the species

B = Fair, but other recommended viburnums are as good or superior as ornamentals

C = Has little ornamental value

acerifolium glabrescens	A	erubescens	B
acerifolium ovatum	A	erubescens gracillipes	A
betulifolium	B	foetidum	NH
bitchiuense	C	“ ceanothoides	NH
bracteatum	C	“ rectangulatum	NH
buddleifolium	B	fragrans	NH
burejaeticum	C	“ album	NH
burkwoodii 'Park Farm Hybrid'	A	“ candidissimum	NH
calvum	NH	furcatum	NH
cinnamomifolium	NH	grandiflorum	NH
cordifolium	NH	harryanum	NH
corylifolium	B	henryi	NH
cotinifolium	B	hillieri 'Winton'	NH
cylindricum	NH	hupehense	B
dasyanthum	NH	ichangense	B
davidii	NH	jackii	B
dentatum deamii	A	japonicum	NH
dentatum pubescens	A	kansuense	C
ellipticum	B	lantana	B
erosum	B	“ discolor	A
erosum taquetii	A	“ macrophyllum	A



PLATE IX

(Top) *Viburnum carlescephalum*. The new Fragrant Snowball.

(Bottom) *Viburnum sieboldii*. The flowers are small, but are borne profusely every year.

lantana variegatum	C	propinquum lanceolatum	NH
lantanoïdes praecox	A	rafinesquianum	C
lentago sphaerocarpum	A	“ affine	C
lobophyllum	B	rhytidocarpum	NH
macrocephalum	NH	rhytidophyllum	B
“ keteleeri	NH	“ variegatum	C
molle	B	sargentii	B
“ leiophyllum	A	“ calvescens	A
mongolicum	B	scabrellum	NH
nudum	NH	schensianum	C
nudum angustifolium	NH	setigerum	B
odoratissimum	NH	“ aurantiacum	B
opulus roseum	B	suspensum	NH
orientale	C	sympodiale	B
ovatifolium	B	tinus	NH
phlebotrichum	NH	urceolatum	C
plicatum lanceolatum	A	utile	NH
“ parvifolium	A	wilsonii	NH
propinquum	NH	wrightii eglandulosum	A

A note should be made of a few others that have not yet been fully tried and hence can not be properly assessed at this time. They are *V. bodnatense* which may not prove reliably hardy here; *V. carlesii compacta*; *V. cassinoides nanum* which should be an excellent shrub but for some reason or other has died out repeatedly in the Arboretum collections; *V. chenaultii* which is supposed to be a “glorified” Burkwood’s viburnum; *V. fragrans* ‘Bowles’ and *compactum*, the latter probably being similar to *V. fragrans nanum*; *V. opulus* ‘Notcutt’s Variety’ and *V. trilobum* ‘Pink Flowered Form’ of the Gellatly Nut Nursery in West Bank, British Columbia.

In closing, the only serious viburnum pest we have encountered should be mentioned — the dogwood twig borer (*Oberea tripunctata*). This borer, about three-fourths of an inch long, eats its way down the center of the twigs and branches into the very roots of the plant itself. Control is effected by using DDT (50% wettable DDT, 3 to 4 pounds to 100 gallons of water), spraying on the older rough bark of branches, trunks and twigs, where the insect lays its eggs. In the vicinity of Boston, the first spray should be applied about June 10 followed by one in mid-July and again by one in mid-August.

DONALD WYMAN

THE STAFF

The Arnold Arboretum has lost the services of two long-time staff members with the retirement of Professor Karl Sax and Mr. Thomas Park, during the summer.

Professor Karl Sax came to Harvard in 1928 and has held a number of joint appointments on the staffs of the Department of Biology, the Bussey Institution and the Arnold Arboretum. He served as acting director of the Arboretum from 1946 to 1947 and as director from 1947 until 1954. His significant cytological work may not be familiar to readers of *Arnoldia*, but his recent publications on the breeding of ornamental shrubs and trees and the production of dwarf trees by bark inversion and other techniques have been printed in this periodical. Dr. Sax will serve as Visiting Professor of Botany at Yale University during the next year, and has already been awarded a Guggenheim Fellowship for work in Oxford, England, the following year.

Mr. Thomas Park has been superintendent of the Case Estates of the Arnold Arboretum in Weston since 1945 when the property was bequeathed to the Arboretum. However, Tom spent his youth on the Case Estates, and has had over fifty years of work with the plants and the soil of the Case Estates. He will continue his interests in horticulture, for he will live on the grounds of the Case Estates for a while and will be available when we need his advice as a consultant.

The appointment of Dr. Joab Thomas as cyto-taxonomist was announced by the President and Fellows beginning July 1, 1959. Dr. Thomas received the degree of Doctor of Philosophy from Harvard for work centering on the *Cyrtilla-ceae*. He will continue the interests of Dr. Sax, developing work on the taxonomy and cytology of woody ornamental plants.

THE ARBORETUMS AND BOTANICAL GARDENS OF NORTH AMERICA

The Arboretums and Botanical Gardens of North America compiled by Donald Wyman. Published by the Arnold Arboretum of Harvard University, Jamaica Plain 30, Mass., 69 pp., illustrated, May 1959. *Price:* \$1.50

This booklet contains detailed information concerning the 109 arboretums and botanic gardens in North America, the number of acres, date established, chief functions, featured plantings, ownership, name of director, and a listing of periodical publications, as well as other pertinent information concerning each. The first publication of this same title by the same author was issued in 1947 and now is out-of-date. The new publication has been completely re-written and gives an up-to-date picture of the arboretums and botanical gardens of North America.

CLASSES AT THE ARNOLD ARBORETUM

Fall Program, 1959

Fall Field Class in Ornamental Plants Instructor: Dr. Donald Wyman
Five meetings. Friday mornings, 10-12, October 2-30. Fee \$2.00

Field Botany I Instructor: Dr. Carroll Wood
Five meetings. Tuesday afternoons, 2-4, Sept. 29-Oct. 27. Fee \$2.00

Ornamental and Economic Plants in Florida and the West Indies
Instructor: Dr. Richard Howard
Six meetings. Thursday evenings, 7-9, Oct. 1-Nov. 5. Fee \$10.00

Plant Ecology in the Boston Area Instructor: Dr. Joab Thomas
Five meetings. Wednesday afternoons, 2-4, Sept. 23-Oct. 21. Fee \$10.00

Plant Propagation Instructor: Mr. Alfred Fordham
Approximately 10 meetings at irregular intervals through the year.
First meeting Saturday, September 26, 9:30 A.M. Fee \$25.00

The Gymnosperms Instructor: Dr. Burdette Wagenknecht
Five meetings. Wednesday evenings, 7:30-9:30, Sept. 30-Oct. 21, plus one field trip to be arranged. Fee \$10.00

Applications will be accepted now for all classes, and should be addressed to Miss Stella Whitehouse, Arnold Arboretum, Jamaica Plain 30, Mass.

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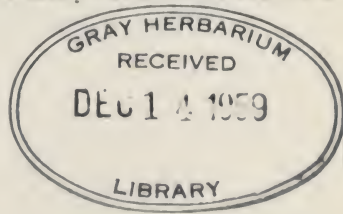
CHRISTMAS PLANTS AROUND THE WORLD

THE practice of using decorated trees in religious celebrations extends into antiquity. The old Germanic priests hung lights on the sacred trees beneath which they offered sacrifices. Wherever they travelled, the Roman legions decorated pine trees with little masks of Bacchus in the festival of Saturnalia. European legend attributes the origin of Christmas trees to an eighth-century Englishman, St. Boniface, a missionary in Germany. Before a crowd of barbarians one Christmas Eve, he cut down a sacred oak beneath which they had made human sacrifices. A young fir tree which had remained undamaged by the fall was presented to the people with the explanation, "This little tree, a young child of the forest, shall be your holy tree tonight." The holy tree it has remained. Legend also has it that Martin Luther was the first to use lights as part of the decorations for Christmas. The earliest authentic record of Christmas trees as we know them today is in a manuscript in which a Strassburg merchant wrote in 1605, "At Christmas, they set up fir trees in the parlours at Strassburg and hang thereon roses cut out of many coloured paper, apples, wafers, goldfoil, sweets, etc."

Most historians are in agreement with the St. Boniface legend that the first Christmas tree was a fir. The custom originated in the beech belt of central Europe where a single green fir in the defoliated brown beech forest becomes strikingly symbolic. It is from this area that the practice of using a tree as a part of the Christmas celebration spread throughout the Christian areas of the world. The trees of the new areas were usually conifers closely resembling the fir of central Europe. As the custom spread into areas where plants of this type were not available, often the substituted trees were neither closely related, nor similar in appearance to the fir. In many areas, shrubs or herbaceous plants were also used for making Christmas wreaths and other decorations.

In the preparation of this summary of the plants now used in Christmas celebrations throughout the world, inquiries were sent to many countries to ascertain

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not only the principal plants used in Christmas decorations but also those which are dominant in the landscape at the holiday season. The following is a resumé of the answers returned from more than forty individuals representing twenty-one countries, as well as material gathered from various other sources.

The United States

The New England areas will be discussed only with reference to the range of use of certain plants as decorative material. This area has previously been covered in detail by Drs. Howard and Wood in their publication, "Christmas Plants in the Boston Area," *Arnoldia* 15: 61-84. 1955.

Perhaps a few statements about the widespread use of Christmas trees in the United States will give some indication of the size of the Christmas tree industry. The United States Department of Agriculture Information Bulletin No. 94, "Christmas trees, the Tradition and the Trade," reports that 25,369,223 trees were sold in one year during the early nineteen fifties. In contrast with this, the 1923 report indicated a total sale of approximately 5,000,000, a gain of more than 500 percent in about thirty years.

In the western half of the United States and Canada the most frequently used Christmas tree is the Douglas fir, *Pseudotsuga menziesii*. According to the United States Department of Agriculture report mentioned above, more than seven million specimens were sold. This is an especially desirable tree because it has a full, symmetrical shape, retains its fragrant, nonprickly needles throughout the holiday season and though bound in bundles for shipping, quickly regains its desirable shape when ready for use.

In the northeastern areas of the United States and in southeastern Canada the traditional tree is the balsam fir, *Abies balsamea*. In addition to having all the desirable attributes of the preceding species, this tree is especially desirable to many, because, in this species more than in most, the twigs resemble crosses. That is, the tiny twigs are at right angles to the branches from which they arise. Slightly more than six million individuals of this species were commercially harvested according to the government report cited above.

Throughout the eastern half of the United States, and especially in the southeast, the Christmas tree used often is the red-cedar, *Juniperus virginiana*. Native or naturalized in a large number of habitats over the eastern half of the country, many plants of this species are gathered by individuals from the forest as a substitute for the firs and spruces offered commercially. The small, scale-like needles of this species give an entirely different aspect to this tree when compared with the firs, spruces and pines. The prickly needles detract from the desirability of this plant which usually sells for a lower price than other species offered for sale.

In Pennsylvania and the eastern Great Lakes region the tree most often used is the Scots pine, *Pinus sylvestris*. If one considers Europe as well as North America, one finds this to be the species of pine most commonly used as a Christmas



PLATE X

Pseudotsuga menziesii. In the United States, the Douglas fir is more often used as a Christmas tree than any other species.
 (Left) Habit, (Right) Cones and foliage.

tree. Since this species was introduced from Europe, all specimens produced commercially come from planted stock. If given enough space to allow for proper growth, it becomes a shapely tree. It responds well to pruning and shearing which, when properly done, produces a very dense tree. The characteristic rather orange-colored bark which may appear on plants of Christmas-tree size adds to its attractiveness.

The four previously discussed species account for approximately seventy percent of the trees commercially produced for this purpose. Not identified in any of the correspondence submitted for this report is the remaining member of the first five trees in commercial production, the black spruce, *Picea mariana*. This omission is quite readily explained. The very small needles make the spray-painting of this species especially successful; thus many specimens are sold as very gaudily painted trees. The black spruce is a very slow-growing tree; so slow, in fact, that it often produces cones before reaching a salable size, the only tree listed which generally does so. Most of the plants produced commercially are grown in the swampy regions of Minnesota.

Of more interest than the trees grown in large commercial quantities are those which are sold in limited numbers. These are trees which may be in commercial production but have not been grown in sufficient quantities to appear over the entire country, or trees whose ecological requirements are such that they will not respond to the commercial growers' agricultural practices.

In the northwestern portion of the United States and adjacent Canada many large forests of conifers are found. Most of these species are utilized, either through a commercial outlet or by individuals who cut their own trees. The Douglas fir is native here and is often cut from the forest rather than purchased from a dealer. The most desirable tree in this area is the Rocky Mountain or subalpine fir, *Abies lasiocarpa*. In addition to the desirable characters found in the balsam and Douglas firs, the subalpine fir is most attractive because of the striking contrast between the blue-green needles and the ashy-gray branchlets. Difficult to acquire, it commands a higher price when offered for sale and makes what is to many people the most beautiful tree of all. Those who wish a much less expensive and correspondingly much less desirable tree use the ponderosa pine, *Pinus ponderosa*. Common in many areas, it is probably more often cut from the forest than purchased.

Decorative materials in this area are similar to those found in the remainder of the country, with some use made of the species which occur locally. Branches of the ponderosa pine are used as sprays for fireplace mantles and front doors. The usual practice is to gather fallen cones to attach to the branch when displayed. Most wreaths and sprays are made from the giant western cedar or arbor-vitae, *Thuja plicata*.

The plant dominating the landscape at the Christmas season varies from place to place in this section. In the prairies the most conspicuous plant other than the

grasses is the big sagebrush, *Artemisia tridentata*. In the mountains below five thousand feet in altitude, the Douglas fir, ponderosa pine, western larch, and lodgepole pine dominate the scene. Above five thousand feet, the most conspicuous trees are the subalpine fir and Engelmann spruce. On the coastal side of the mountain ranges several cultivated broadleaf evergreens appear conspicuously. Fruiting specimens of various *Mahonia*, *Buxus* and holly species appear commonly. One also finds the mountain ash and the cotoneasters to be very attractive because of their fruits.

The most common Christmas trees at the University of Alaska are the Douglas fir and balsam fir, both of which are imported. The native species most often used is the white spruce, *Picea glauca*. This is rather undesirable since this, as well as other spruces, tends to lose its needles more readily than do the two imported species. If cut early in the fall, the tree is rarely in good condition for use at the holiday season due to needle loss. If cut during the early part of December the temperatures are often an minus forty degrees Fahrenheit, freezing the tree and making it so brittle that it is not at all unusual to lose all the branches when felling it.

At this latitude the vegetation is almost non-existent during the Christmas season, with only the white and black spruces and the tamarack to be seen in the countryside.

In California the situation parallels that found in the northwest. The Douglas fir is native and used more often than any other species. However, several others are used, either because they are more attractive or because they are available at lower cost. Most species of pine and juniper fall into the latter category. A tree often sought for and commanding a higher price is the white fir, *Abies concolor*. The large, soft needles found on this tree make it very decorative. Another desirable native is the Noble fir, *Abies nobilis*. The out-of-doors living Christmas tree decorated with colored lights is often the deodara cedar, *Cedrus deodara*.

Plants producing material for decorative uses are numerous here. Wreaths are usually made from the coast redwood, *Sequoia sempervirens* or hollyleaf cherry, *Prunus ilicifolia*. Coming into wider use is the large-leaved hybrid of the latter with the Catalina cherry, *P. lyoni*. The inhabitants of this area are fortunate to have many plants grown in the area producing fruits at this time of year which can be used in decorative arrangements. The one used most often is the toyon, *Pholinia arbutifolia*. This plant is so popular at this time of year that it is also widely known as the Christmas-berry. Other fruits used here are those of various species of cotoneasters, of the firethorn, *Pyracantha crenato-serrata*, and of the pepper-tree, *Shinus molle*. The latter is often grown as a street tree. Plants considered decorative because of their foliage are mistletoe, *Phoradendron flavescens* var. *macrophyllum*, and various species of cypress, mostly *Cupressus macrocarpa*. Many pods and cones are often used and often these are gilded, silvered or colored in various ways. In the coastal areas, particularly in southern California, poin-

settias, *Euphorbia pulcherrima*, and eucalyptus leaves, buds and capsules are used. Citrus fruits are sometimes used, especially in the fashioning of Della Robia wreaths which are often backed by the leaves of *Magnolia grandiflora* or perhaps English laurel, *Prunus laurocerasus*. Magnolia leaves and fruits, usually dried, sprayed or painted, are often used in decorations. The English holly, *Ilex aquifolium*, is found only occasionally. The commercial source of this plant is the Pacific northwest. The plant is so expensive it is never freely used in decorations, being more often worn as a corsage.

Northern California is dominated by the various gymnosperms located along the coast and in the mountains. The endemic *Sequoia* along the coast is among the most attractive. In the southern parts of the state one finds many exotic plants, such as various species of palms which line the boulevards, the *Schinus molle* mentioned above, and the eucalyptus which is commonly found throughout this region. Among the plants which are striking for their red fruits are the Christmas-berry, *Photinia arbutifolia*, various species of *Cotoneaster*, *Pyracantha* and, on rare occasions, *Crataegus*.

The variation of local tastes is perhaps best illustrated by the reports gathered from Louisiana and Texas. Probably the tree most commonly sold in this general area is the Douglas fir. In New Orleans, however, the balsam fir was reported to be the tree most commonly sold; in San Antonio the blue noble fir, *Abies nobilis* var. *glauca*, was the biggest seller. It should be pointed out that these reports are from commercial sources. Many people cut their own trees, however, which in Louisiana and eastern Texas are most likely to be the red-cedar or, in some cases, the native pines. In western Texas other species of juniper are utilized. A most unusual plant used for this purpose is the salt cedar, *Tamarix gallica*. An angiospermous plant bearing a profusion of pink or white flowers in the summer, it resembles in foliage and habit some of the scale-needled genera of the gymnosperms. It is an introduced, arborescent weed growing in great abundance along the watercourses and in saline areas throughout much of the southwest. This plant is used by many of the Latin Americans in southern Texas. Properly decorated and with perhaps a few branches added to make it more dense, this is an attractive and inexpensive tree.

Decorative materials in this area are similar to those in other regions of the United States. The three hollies, *Ilex cornuta*, *I. decidua* and *I. vomitoria* are commonly used, the latter species being used more often than the first two. *Pyracantha* species, poinsettias, and chrysanthemums are used in many homes. Not widely practiced is the old custom of dipping wet plants of *Tillandsia usneoides*, the Spanish moss, and *T. recurvata*, the ball moss, in flour and using them when dry as snow drapes and snow balls.

Horticultural plants of interest at this time of year are the poinsettias which are grown out of doors, often reaching a height of six feet. These plants are somewhat of a risk to use since in San Antonio they may freeze as often as one



PLATE XI

Picea abies. In Europe, the Norway Spruce is used as a Christmas tree more than any other species.
(Left) Habit, (Right) Cones and foliage.

year in two before the Christmas season. A plant which is being recommended by the San Antonio nurserymen as the coming plant for Christmas display is *Ardesia crenulata*, a small, slow-growing shrub with glossy, dark evergreen leaves and clusters of crimson berries which are retained all winter.

Among the trees which are noteworthy at this time of year are the various species of junipers, pines and the oaks, some of which retain their leaves throughout the winter. Many trees are parasitized with mistletoe which is quite prominent at this time of year. Along the streams and in some drier areas the mesquite is common. Late-flowering species of rabbit-brush, *Chrysothamnus*, may still bear fruits at this time of year.

In the northern plains nearly all the trees used are imported. The most commonly imported tree is the Douglas fir. Some spruce and pine are used in small quantities. The colorful Colorado blue spruce is sometimes imported here, as it is in other areas. This tree makes a spectacular showing, particularly if it is a good bright blue, and commands a higher price than do other trees commercially available. The only native tree which is used to any extent is the red-cedar. Most of these are obtained from pastures and woodlands by individuals cutting trees for their own use.

Decorative material in this area is of imported greenery, usually arbor-vitae or ponderosa pine from the Rocky Mountains, with a small amount of mistletoe and holly imported from the South. The Christmas fern, *Polystichum acrostochoides*, is used as decorative material in areas where it can be collected easily. Little commercial use of the plant is found.

The area is a barren one in winter. The only relief from the monotony of the grasslands and fields is furnished by the large, gaunt cottonwoods, *Populus deltoides*, and the white-branched sycamore, *Platanus occidentalis*.

In the southeast, the red-cedar mentioned above is the tree most often sold commercially. A large number of gymnosperms are native to this area and are cut and sold in commercial quantities. Many other trees are cut by individuals from the forest rather than purchased. A most attractive tree native to the Appalachian Mountains of western North Carolina, eastern Tennessee, and southwestern Virginia is the Fraser fir, *Abies fraseri*. In the area in which it is native it is much sought after. It is a tree which the United States Department of Agriculture has suggested as being suitable for cultivation as a commercial source for Christmas trees. It is possible, therefore, that the use of this tree may become more widespread, particularly in the southeast. Several species of pine are also used. Among these are *Pinus echinata*, the short-leaf pine, *P. taeda*, the loblolly pine, *P. elliottii*, Elliott's pine and *P. clausa*, the sand pine. The use of these species is closely linked to their lower sale price. One of the pines which does make a very interesting and attractive tree is the longleaf pine, *Pinus australis*. The character of this tree which makes it so desirable is the radiation from a common point of the 10- to 20-inch needles in a star-like or rosette pattern

along the branches. A rather unusual Christmas tree for this area is the Arizona cypress, *Cupressus arizonica*, which has blue-green, scale-like needles and a dense growth habit. This native of the southwest grows slowly under the conditions existing in its native habitat and is in some danger of being eradicated. In the northeast this species is rarely seen and then only in sprays and wreaths. However, it is now being produced commercially in some quantity on Christmas tree farms in South Carolina. The milder winters of the southeastern and southern portions of the United States make possible the growth of many broadleaved evergreen species which are not hardy farther north. Although not gymnosperms and differing from them in nearly all characters except the retention of leaves throughout the winter, some are used as Christmas trees. One species used for this purpose is the American holly, *Ilex opaca*. The leaves of the native bull bay, *Magnolia grandiflora*, are often used in the manufacture of wreaths, but the use of it as a Christmas tree is rare enough that a description of its use may be of some interest. Small trees (preferably pot-grown for this purpose) are treated with one of the compounds used to remove the dull surface film from the leaves and make them shiny. Fruits of this species are dipped in shellac, dusted with metallic powder or any of the colored powders of this type and allowed to dry. The fruits are then fitted with hangers and placed on the tree in the same manner as are glass ornaments on traditional trees. Strings of popcorn complete the decoration.

The southeast is fortunate in having many of the plants which are used for decorative material either as native or as introduced plants which survive in this mild climate. *Smilax laurifolia*, several species of holly, various glossy-leaved evergreen species of privet and *Magnolia grandiflora* are used as sources of foliage materials. In much of the area mistletoe is native and can be collected rather than purchased. The various pines, in particular the longleaf pine, are used in the construction of wreaths and sprays. Swags and sprays are sometimes made from the Australian pine, *Casuarina equisetifolia*, as well. Although actually an angiosperm, the branchlets of the latter resemble the needles of the pine and the cone-like fruits produced by this species heightens this resemblance.

Berried fruits commonly seen in this area are borne by species of *Pyracantha*, *Cotoneaster* and *Ardisia*. Plants found to be in flower at this time of year include various species of camellias and flowering quinces. *Sabal palmetto* is a native to the Gulf Coast area and is very prominent at the holiday season. The royal palm *Roystonea regia*, though native to Florida, appears quite exotic to the visitor from the more northern areas. Cultivated palms include *Washingtonia robusta* and *Phoenix canariensis*. Many species of oaks in this area are evergreen and are usually known as live oaks because of this characteristic. The living Christmas tree with the greatest limb spread is a 300-year-old live oak with a spread of 11.5 feet. Growing in Hilton Park in Wilmington, North Carolina, this tree displays seven thousand lights and bears six tons of Spanish moss.

Caribbean Area

In the Caribbean region the Christmas trees are usually species of pine. The principal one used is *Pinus caribaea*, the Caribbean pine. Various firs and spruces are also imported for some of the more wealthy residents. The Douglas firs produced in Montana are sold as far south as Puerto Rico. Several species of angiosperms are used here. One so used is the Australian pine mentioned above. Another is a broadleaved angiosperm of the genus *Randia* which is used in Puerto Rico. The special advantage of this plant is that it bears white fruits at Christmas and thus is already partly decorated.

Flowering plants are an integral part of the holiday scene in this subtropical and tropical region. Here the poinsettia, often used as a hedge, spreads its flaming beauty free from the danger of frost damage. Two flowering plants which have wide acceptance at this season are *Porana paniculata* and *Antigonon leptopus*. The first species is a member of the convolvulus family. A relative of the morning glory, it is a vigorous, evergreen woody climber covered with a profusion of tiny, fragrant white flowers borne in panicles at the top of each branchlet. The leaves are large, heartshaped and densely pubescent beneath. Several common names have been applied to this plant. In Trinidad it is known as corallila; in Florida as the snow-creeper or the Christmas vine. The latter name is not appropriate in Florida since normally it flowers long before Christmas and bears only the unsightly fruits at this time. *Antigonon* is a member of the buckwheat family known as coral-vine in Florida and as corallita in the West Indies. A rapidly growing climber clinging by tendrils, the plant is valued because of its large racemes of rose-pink flowers borne freely throughout the flowering season.

South America

The practice of using Christmas trees has not been widely adopted in South America and at present is confined to some of the immigrant populations there. Most of these people use artificial trees. It is possible that the use of Christmas trees will become more widespread in the future. At least, the commercial houses in the larger cities now use them in their seasonal decorations.

Europe

Throughout Europe the most common Christmas tree is the Norway spruce, *Picea abies*. This species has been introduced into the United States and is widely cultivated, but constitutes only about two per cent of the total commercial production of Christmas trees. It is dense, symmetrical and has good color and fragrance, but it has a tendency to drop its needles when subjected to high indoor temperatures. The cooler temperatures maintained in European homes prolong the beauty of the tree and this probably accounts for its greater popularity.

Great Britain

The Christmas trees of Great Britain are most often the Norway spruce and the Scots pine. Other species may be used as they are locally available.

The customs of Christmas in Great Britain are more familiar to us than those of any other country. The Yule log and the plum pudding are traditions well known to all. The decorative materials are also widely known, although the familiar common names may refer to quite different plants. For example, mistletoe is widely used but it is somewhat surprising to find that the mistletoe of Great Britain and Europe is *Viscum album* while in America it is *Phoradendron flavescens*. Both are members of the Loranthaceae, however. The former has flowers in terminal clusters, with anthers adnate to the perianth lobes and anthers opening by pores; the latter has flowers in spikes, with the anthers free from the perianth lobes and opening by slits. In most other characters they resemble one another and the American substitution is a logical one. Other foliage plants used in wreaths, sprays and corsages are English holly, *Ilex aquifolium*, cherry laurel, *Prunus laurocerusus*, and Portugal laurel, *P. lusitanica*.

A practice still found in certain areas of Great Britain and Europe is that of bringing indoors potted cherry or hawthorn trees so that they may flower at Christmas. In England a popular superstition is connected with St. Joseph of Arimathea, whose staff put forth leaves when he planted it in the earth at Glastonbury and by tradition thereafter flowered at Christmas. At the time of the last revision of the calendar the traditionalists who opposed the change used this plant as a proof that the revision was wrong. Since that time the tree has bloomed from the old Christmas to the new, thus supporting both views.

Ireland

In addition to the Norway spruce, the Irish use *Picea sitchensis*, the Sitka spruce, introduced from the West Coast of the United States. The traditional decorative plants in Ireland are the holly, the mistletoe and the poinsettia. Other plants which are commonly encountered are *Solanum capsicastrum*, the Jerusalem cherry, the English ivy and various azaleas, all of which are grown in pots.

Trees and shrubs in flower during the holiday season include *Prunus subhirtella* var. *autumnalis*, *Fiburnum fragrans* and *Jasminum nudiflorum*. The flowering of these plants at this time of year at latitudes much farther north than Boston is a reflection of the milder winters produced as a result of the influence of the Gulf Stream. Trees and shrubs which are conspicuous because of the fruits are the strawberry tree, *Arbutus unedo*, which bears red fruits and white flowers at this season, and various species of *Pernettya*, whose red fruits are most attractive. In addition to the pines, firs and yews whose foliage is particularly prominent at this time, one is especially conscious of the English holly in the country districts and of the various color forms of *Chamaecyparis lawsoniana* in the gardens.

Belgium, Netherlands and Luxemburg

The region which includes Belgium, the Netherlands, Luxemburg and northern France is one in which the Norway spruce is most widely used. The white and Colorado spruces are sometimes substituted, but these are somewhat rare and, according to my correspondents, much more expensive.

The decorative materials used are typical of most European areas. Sprays usually consist of cone-bearing branches of *Abies nordmanniana*, the Nordmann fir, tied with colored ribbons. Fruiting branches of English holly, the black alder or winterberry, *Ilex verticillata*, *Cotoneaster salicifolia* and *C. horizontalis* are also used in the decorative scheme. An unusual note is the use of flowering branches of *Hamamelis mollis*, the witch hazel. Various lichens and mosses are used as garlands in place of the lycopodias and selaginellas used in the eastern United States.

Woody plants usually in flower are *Prunus subhirtella* var. *autumnalis*, *Parrotia persica*, *Hamamelis virginiana*, *H. mollis* and *Erica carnea*. Fruiting plants of note are the pyracanthas, cotoneasters and hollies.

Germany

The Christmas trees of Germany are of the same species as those listed for the preceding area. Most of the decorative material is identical except for the use of *Acacia* foliage and the cone-bearing branches of Douglas fir used in sprays.

Scandinavia

The Norwegians and Swedes have used Christmas trees for little over one hundred years. The Scots pine was first used, but has been largely replaced by the Norway spruce. Other species of spruce or fir which are locally available are also used. In this area of large, coniferous forests the symbolism of an evergreen tree is not so marked as it is in the beech belt. The holly is occasionally used to make a Christmas tree, as it is in the southeastern United States.

Decorative material is usually holly, with an occasional spruce or fir bough used as a spray. Old Norwegian Christmas traditions usually did not include green decorations. In a few places green branches were hung over doors and windows, but such traditions were less widespread than those concerned with the use of sheaves of grain.

Potted plants used at this time of year include the Christmas rose, *Heleborus niger*, the poinsettia, here sometimes called the Christmas star, and the Christmas cactus, *Epiphyllum truncatum*.

Spain

In Spain the use of Christmas trees began even more recently than it did in the Scandinavian countries, but has already had considerable effect upon the flora of the country. The first plant used was the silver fir, *Abies alba*. Unre-



PLATE XII

(Above) Cones and foliage of *Juniperus virginiana*, the red cedar. (Below) Cones and foliage of a species of *Cupressus*. This genus is used often as a source of Christmas trees in the Middle East and Africa.

stricted cutting of this tree brought destruction to the few woods of the species that existed in the country. The trees currently in use are the Scots pine, English yew, *Taxus baccata*, and the cultivated Spanish fir, *Abies pinsapo*.

English holly is used for decorative material here, as it is in most European areas. The mistletoe in Spain is *Viscum laxum*, a different species, though the same genus, from that used in northern Europe. *Ruscus aculeatus*, the butcher's broom, a weed in various parts of the Mediterranean region, is used in some homes for decorative purposes. No information is available as to whether in Spain it is dyed bright shades of red, pink or green, as is done in the United States.

Forests in Spain and Portugal are quite restricted as compared with the large forests of northern Europe. Two broadleaved evergreens are very commonly seen, the economically important cork oak, *Quercus suber*, and the olive, *Olea europaea*. The latter is widely cultivated throughout the Mediterranean region. In Barcelona the Spanish fir is cultivated in sufficient quantities to be a prominent part of the scene.

Asia

Israel and Lebanon

The areas in which the Christian religion had its beginnings are now under the control of governments whose official religions are not Christian. However, some Christians live in these areas and they use decorative materials in celebration of this religious holiday. In Jerusalem the trees commonly used are *Cupressus sempervirens* var. *horizontalis*, the Arizona cypress, *Cupressus arizonica*, and the Aleppo pine, *Pinus halapensis*. In Lebanon the stone pine, *Pinus pinea*, the evergreen cypress, *Cupressus sempervirens*, the Brutian pine, *Pinus brutia*, and the Cilician fir, *Abies cilicica*, are also used when available. Surprisingly, the Cedar of Lebanon, *Cedrus libani*, is not used for this purpose. It would seem that the Biblical connotations of this plant should have caused this to be one of the more symbolically desirable trees.

Little decorative material is cited from Lebanon. The only plant specifically mentioned is mistletoe, probably a different one from that used in northern Europe. In Jerusalem many plants are at their best at this season. *Asparagus sprengeri* and various species of cotoneasters are used for their red fruits. The cone-like fruits of the Australian pine, *Casuarina equisetifolia* and the acorns of *Quercus caliprinos* are commonly used in arrangements. Foliage material of *Acacia*, laurel, evergreen privets, myrtle, the pistacio, *Pistacia lentiscus*, rosemary, *Rhamnus alternus*, and several species of pittosporum offer a wide variety of leaf size, shape and texture.

India

Replies from a Catholic college and a Hindu university indicate that the practice of using Christmas trees has not been adopted by the Christians of India.

This may be due to the lack of trees suitable for the purpose in the areas contacted. However, decorative materials are used in the celebration of the holiday. Several native species of *Viscum* are used as mistletoe and in the southern part of Bombay State one of the ground pines, *Lycopodium cernuum*, is a traditional decorative material. Holly is not native to this area but a good substitute is *Acanthus ilicifolius*, whose leaves are remarkably like those of holly. The use of this plant is restricted, since it occurs abundantly only in mangrove swamps near the sea.

The environment in this area is quite different from those previously described and the vegetation is an expression of that difference. More conspicuous than the occasional conifers are such woody plants as *Olea dioica* (a member of the same genus as the olive previously mentioned), the clockvine, *Thunbergia laevis*, and the allamanda, *Allamanda cathartica*, all of which flower at this time.

Thailand

The southeastern asiatic country of Thailand with its temples and oriental pagentry is one in which the use of Christmas trees might not be expected. However, both indigenous and exotic species of trees are used for this purpose. Several species of the genus *Araucaria*, the monkey puzzle trees, are native and are used as they are locally available. The introduced angiospermous *Casuarina equisetifolia* and *C. junghuhniana* are more commonly used than any other trees.

Flowers used in Christmas decorations are very much different from those in use in Europe or North America. Some mentioned in particular were orchids, gerberas and roses. The poinsettia is grown out-of-doors here and is very large and showy at this time of year.

In this tropical area it is extremely difficult to name one or more plants as being characteristic of the landscape. Most of the trees and shrubs are not in flower at this season and thus the individual plants tend to be lost in the masses of foliage.

Japan

The Christmas tree custom is well established in the Christian population of Japan. The tree used more than any other is the Momi fir, *Abies firma*. Other conifers are used when available. The Norway spruce is cultivated in this country and is used in limited quantities.

Decorative materials are varied and plentiful in this country, and when arranged with the traditional skill of the Japanese, result in a movingly beautiful display. *Nandina domestica* is justly popular for the decorative effects of its clumps of erect, reedlike stems, large, fernlike leaves which become red in winter and its clusters of bright scarlet fruits. *Chloranthus glaber* is used for its shiny leaves. The chrysanthemum, national flower of Japan, is used in bouquets at this time, as well as for other celebrations during the year. Poinsettia is grown out-of-doors and is most attractive. *Spiraea thunbergii* may still be in flower on the southern islands

of the chain and when available is also used, as are sprays of tulips, irises and carnations. Branches of *Ilex serrata* are used quite widely, but the use of the European holly is rare. Potted plants, generally cyclamens, cineraria, primulas and orchids are also in demand.

Among the more prominent trees and shrubs are the wild and cultivated plants of *Ilex serrata* which display red berries, cultivated plants of *Camellia sasanqua*, *Eriobotrya japonica*, the loquat, in fruit at this time, *Pyracantha angustifolia*, conspicuous in fruit and widely used as a hedge, *Fatsia japonica* and the *Nandina domestica* mentioned above.

Africa

The use of Christmas trees on the continent of Africa is limited to the southern half where the population contains large numbers of Dutch and English colonists whose ancestors brought the custom with them. The conifers native to this area are members of the genus *Widdringtonia*. These species are not used, however, and so Christmas in South Africa is generally celebrated with introduced trees. In Rhodesia *Cupressus arizonica*, the Arizona cypress, and *C. torulosa* from China are most often used, though *Pinus patula* from Mexico and *P. halepensis* from southern Europe and western Asia, as well as *Cryptomeria japonica* from Japan are also used to a lesser extent. In the Cape Provinces *Pinus pinaster*, a native of the Mediterranean area, is the most commonly used tree, while the inhabitants of Transvaal use *Pinus longifolia* and *Cedrus deodara*, natives of the Himalayas.

As was the case in India, some substitutions are made for typical English plants. *Psorospermum febrifugum*, a member of the family Guttiferae, is used in place of holly, while several indigenous species of *Viscum* are substituted for *V. album*, the mistletoe of northern Europe. The reversal of the seasons in the Southern Hemisphere causes Christmas to fall in early summer at the height of the growing season. Flowers, plentiful at this time, form the basis for most Christmas decorations and include dahlias, zinnias, asters, gladioli, roses, chrysanthemums and various so-called daisies. Often the fronds of several *Asparagus* species are used with paper streamers about the walls of a room or are made to trail down the center of dining tables. A somewhat unusual decorative plant is *Asclepias physocarpa*. Quite weedy in growth, its large, inflated pods which appear in December are used in flower arrangements. In recent years the more progressive florists have exhibited these pale green, slightly prickly pods in their window displays where they are quite striking, especially when partially sprayed with silver and used in Christmas bouquets. The soft papery pods of this species grow to about two and one-half inches in diameter and are nearly spherical in shape. The plant is called wild cotton because the seed pod opens to reveal seeds attached to a mass of silky white hairs.

One of the peculiarities of the Southern Hemisphere is found in the linking of certain plants in flower at this time with the celebration of Christmas. One of



PLATE XIII

(Above) Various species of fir showing the cross-like arrangement of the terminal and lateral branchlets. Top row: *Abies balsamea* and *A. concolor*. Bottom row: *A. veitchii*, lower surface; upper surface; and *A. homolepis*. (Below) *Ilex vomitoria*. A native holly of the Southern Coastal Plain, used locally as a source of decorative material.

the most widely grown plants connected with the season is *Hydrangea macrophylla*, known throughout the region as Christmas flowers. This choice may seem odd to the inhabitants of the Northern Hemisphere accustomed to seeing this plant flower in August. *Pavetta bowkeri* is known widely in South Africa as the Christmas bush. This plant is a dainty, evergreen shrub which grows to a height of from three to six feet. In December and January it bears attractive, rounded heads of pure white flowers, each head measuring from three to four inches in diameter. The heads consist of a compact cluster of small, long-tubed flowers opening into four starry, pointed petals. Their decorative value is enhanced by the delicate white styles which protrude from each flower. The oval, tapering leaves are a deep glossy green and measure about two to three inches in length. The shrub is closely related to *Ixora* and is a member of the Rubiaceae. It occurs as a native in all provinces except the southwestern cape. *Sandersonia aurantica* is known as Christmas bells or as the Chinese-lantern lily. As indicated by the second common name, this plant is a member of the lily family and is closely related to *Gloriosa* and *Littonia*. Each attractive, clear orange flower is over one inch long and one-half inch in diameter. It is puffed into the shape of a bell and is slightly constricted at the mouth where it is flushed with yellow. Each single flower hangs down gracefully from a curved, wiry flower stalk. It is in some danger of eradication due to depredations of thoughtless collectors. While the previous plant is known as Christmas bells, *Blandfordia flammea* is known as the Christmas bell. It is also a member of the lily family bearing clusters of yellow-tipped, red bells, on three-foot stems. *Chironia baccifera*, a member of the Gentian family, is known as the Christmas berry. This plant is an evergreen perennial growing to a height of about eighteen inches, forming a rounded mass of thin green upright stalks, bearing narrow, rather fleshy leaves. In November and December the small bushes are covered with bright pink, star-shaped flowers which are followed immediately by scarlet berries about the size of peas.

In addition to the plants listed above which are prominent, the rainy season brings other tropical and sub-tropical trees and shrubs to full flower. Among the more showy are bougainvilleas, the flamboyant, the frangipanni, acacias and baubins. The traditional temperate zone festivities are superimposed upon completely different climatic conditions, tending to give an artificial complexion to the holidays.

Australia and New Zealand

The English settlers of Australia and New Zealand brought with them the customs of their native land and adapted them to the conditions they found in the new homes. Here also, Christmas is a midsummer holiday. In many areas of Australia the Christmas tree is a species of *Araucaria* planted in a tub, to be decorated and displayed out-of-doors. The native *Callitris glauca* and *C. propinqua* are used as cut trees when available. *Pinus radiata*, introduced from Mexico,

and *P. canariensis* of the Canary Islands are also used. Perhaps the most exotic plant used is *Exocarpos cupressiformis*, the cherry ballart, a member of the sandalwood family. Although an angiosperm, this tree has foliage resembling a cypress or, more closely, a *Callitris*. The fruit is a berrylike seed borne at the tip of the branch on a red stalk. The fruit and the stalk serve as built-in decorations in the same manner as the *Randia* fruits do in Puerto Rico.

Here the practice of linking certain flowering plants with Christmas is carried a step further than it is in Africa. In Australia and New Zealand each state has its own Christmas tree or shrub, a plant which is in spectacular flower at this time of year. One of the most colorful is *Ceratopetalum gummiferum*, the Christmas tree of New South Wales. This is usually ten to fifteen feet tall, occasionally reaching heights of forty feet or more. The orange flowers, borne in very large clusters, are picked on Christmas day. The Christmas tree of New Zealand is *Metrosideros excelsa*, a member of the Myrtaceae, to which *Eucalyptus* and *Calandra*, the powder puff tree belong. Covered with red inflorescences whose showiness is due to the colorful stamens, it is the most spectacular plant to be seen in New Zealand at this time of year.

The difference in season is well illustrated by the problems which arise in the use of holly. All holly used in decorations is used for the foliage since the fruits which were so attractive with us are at their best in the month of June.

It would seem that the early celebrants of Christmas in western Europe have handed down some very durable traditions. Wherever they have migrated, and indeed, throughout the Christian world, they have celebrated Christmas with the fir, the holly and the mistletoe, and where these are not to be had, other green trees and other red berries or flowers carry on the theme of Christmas.

BURDETTE L. WAGENKNECHT

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